Democratic Republic of Algeria

University of Algiers 2 - Institute of Archaeology

Pedagogical course handout in the subject of bone Industry

Second-year of Bachelor's degree, specializing in Prehistory"

Industrial Cluster Technology 2

تكنولوجية المجموعات الصناعية 2

Module Manager: Dr Ayati Khoukha

Academic Year: 2023/2024

Introduction:

This handout addresses an important side of prehistoric human life, represented by non-stone materials used in meeting their needs such as cutting, hunting, and others. These materials have been found since the earliest stages of human existence and have evolved as is the case with stone industry. Most researchers define them as iartifacts made from animal (human) parts such as bones, teeth, ivory, horns, ostrich eggs, and tortoise shells, the latter being used by humans for decoration. It is a semester module.

Definition of Bone Industry: prehistoric Archaeologists define bone industry as a set of tools used by humans, deliberately manufactured using hard animal material. This raw material not only includes bones but also encompasses ivory, animal wood, ostrich eggshells, tortoise carapaces, and teeth. To study a set of bone tools, it is necessary to distinguish between these componets elements.

Since the early steps of prehistoric archaeology, fossilized bones bearing various cracks and traces on the surface have attracted the attention of prehistoric scholars. However, a complete understanding was not achieved until the second half of the nineteenth century, thanks to the works of Lartet (1861), as well as earlier works by Garrigou and Mortillet.

Sometimes, the methodology for studying bone tools is carried out through typology, general morphology, and sometimes function. Occasionally, it involves anatomical support, for which we usually seek the expertise of an animal scientist. Additionally, it may involve the technique used, experimental archaeology, as well as other equally important methods such as traceology or taphonomy.

The evolutionary model of tools, which blends typology and functional morphology, includes points, scissors, knives, hammers, ornaments, vessels, and handles. Each category is further subdivided, with an "other" section that gathers tools whose function cannot be clearly determined.

It's also worth noting that the technological aspect remains intricate. Spatial analysis and anatomical-animal aspects generally fall under the purview of specialists. Both bone tools and animal bones can provide fundamental insights into the social and economic aspects of the Late and Middle Stone Age.

I- The bone industry in the Lower and Middle Stone Ages :

It's challenging to define the distinguishing criteria for Lower and Middle Stone Age bone tools today due to the support material. What defines flint-knapping techniques, especially shaping used in bone industry, including : cutting, spreading, scraping, polishing,

drilling, and incising, which are techniques that are almost nonexistent during earlier periods.

Also flaking or initial preparation process, and rarely during actual shaping.

Furthemore, identifying fractures (by percussion for long bones, particularly hooves, to extract marrow) complicates the analysis. This fracturing leads to the formation of numerous flakes resulting from percussion, which occurs for non-food purposes, especially when the purposes overlap.

Some freshly shaped bone fragments can work well in their raw state without the need for additional preparation. They can only be distinguished by the presence of retouching or polishing from the waste debris, and these effects are not always visible to the naked eye or even with a microscope, hence the necessity of using SEM.

What also makes it difficult to identify bone tools is the action of contemporary taphonomic (non-human) factors with deposits. These highly confusing effects closely resemble bone tools and can thus be mixed up. Therefore, an in-depth taphonomic study of all bones must be conducted to detect the effects caused by these external factors. This was first practiced by Kobi in 1938, and as a result of this study, many bone tools lost their status and were no longer considered

tools. Consequently, there is little confidence in the existence of bone tools in the Lower and Middle Stone Ages (especially bone industry), or even completely rejectsd by some prehistoric researchers.

Taphonomy analyzes natural corrosion, trampling, and biting by the fangs of meat-eating animals.

Bone industry implies the repetition of technical movements leading to the tool ceration with identical or very similar shapes. It is currently premature to conceive of a genuine bone industry or animal wood industry for these ancient periods, and recognition of the existence of bone tools or industry has not yet been proven.

Many prehistoric researchers, such as Binford (L.) in 1982-1983, do not believe in their existence until the Upper Old Stone Age.

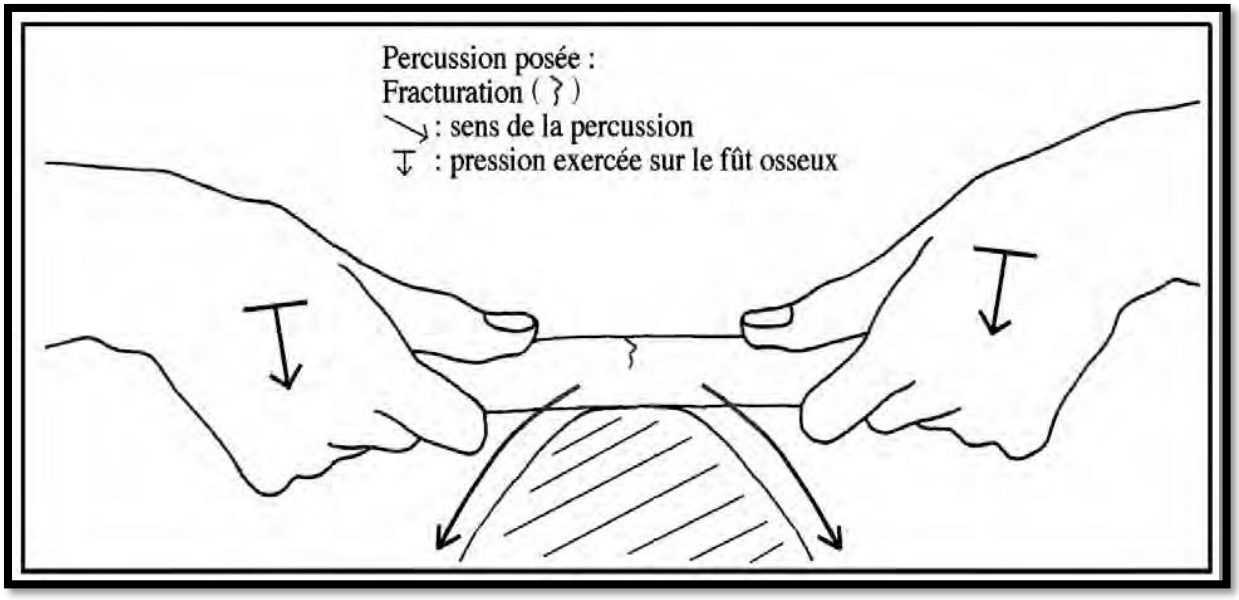
Before about 1940, more than forty publications dealed with the issue of bone tools, indicating the presence of extinct animals within the bones, for bone fragments that were used or shaped, bearing traces of human use and apparently independent of dietary origin. This suggests that these bone tools could compensate for the scarcity or absence of available stone materials near their habitat.

Raymond Dart, in 1925, identified a culture related to the working of bones, teeth, and horns, which he called *osteodentokératique*. For

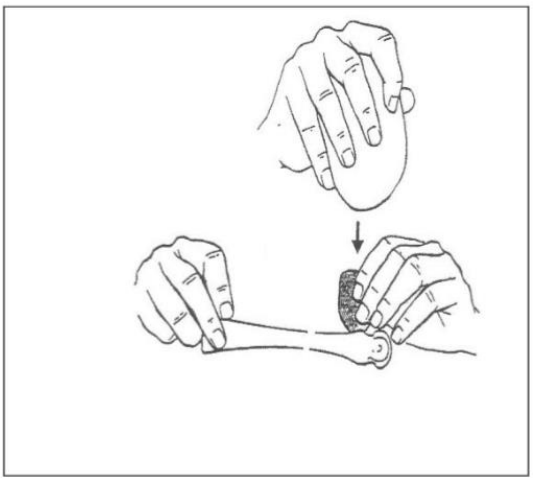
him, there had been a time, before the emergence of stone industries, when prehominiens used these materials.

Currently, the bone industry culture has been replaced by tools or implements made from bones. Some researchers, such as Peabody and Akiyama, conducted numerous experiments on bone fractures in 1965, particularly elephant bones. Consequently, they arrived at a conclusion advocating for the presence of bone tools in the Lower Paleolithic era.

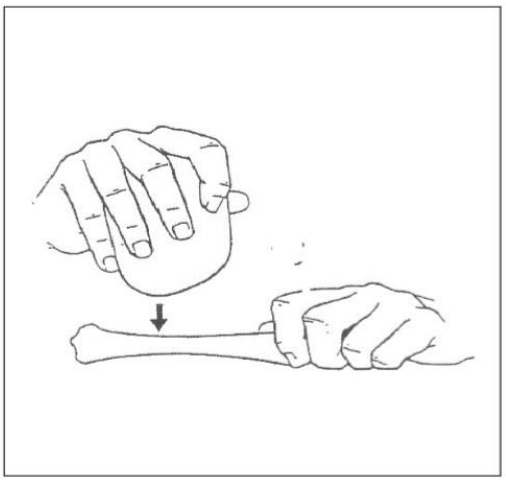
1- After taphonomic analysis, only bone fragments bearing traces of human origin (not related to butchery techniques) are considered and subjected to in-depth study (macroscopic and microscopic analysis) to reinforce hypotheses regarding the identification of tools made from bones and their manufacture. They conducted experiments, which in this case, are necessary.
2- Percussion: This is the classic technique used in the Lower and Middle Stone Ages, where almost all tools shaped during this period were obtained through percussion. These researchers concluded that humans used three methods of percussion:



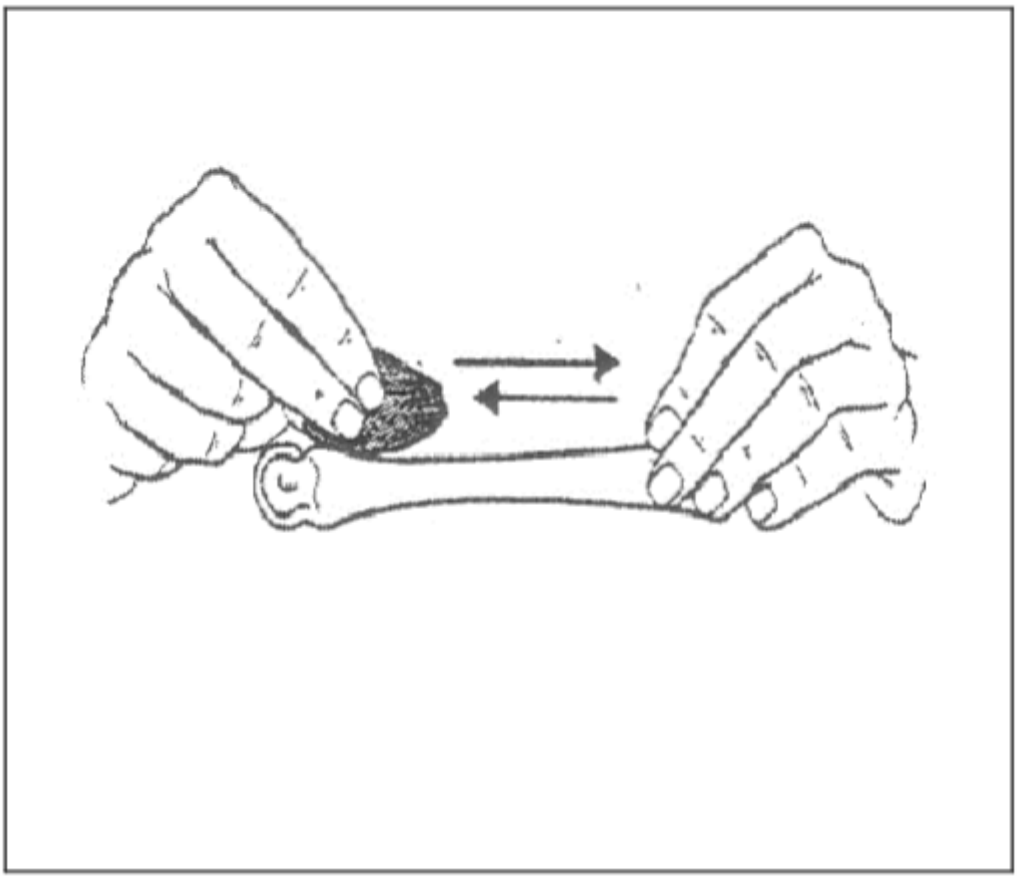
- Percussion with firing pin (Percussion posée avec percuteur): This method involves placing the bone on a support and then striking it using a hammer.
- Thrown percussion (Percussion lancée): This method entails throwing the bone held in the hand towards a solid object, aiming at one of its angles or edges.
- Placed percussion with intermediary (Percussion posée avec intermédiaire) : that is the equivalent of the first method, but in this case, the percussion is not directly applied to the bone but to an intermediary piece (the wedge). The nature of this intermediary piece can vary (hard or soft).



Percussion posée avec intermédiaire



Percussion posée avec percuteur



Sawing

Therefore, among the most significant challenges we face in studying the bone remains of these two periods are:

- Difficulty distinguishing between human-induced fractures and natural fractures.
- Difficulty determining the purpose of the fracture: whether for consumption or use.
- Poor preservation rates due to various factors that bone fragments may be subjected to. These factors may be non-biological, such as climatic conditions or soil nature, or biological, including animal, plant, or human activities.

II- The use of bones in North Africa during the Mousterian and Aterian periods:

So far, researchers have not indicated the presence of a bone industry during the Mousterian and Aterian periods. We must wait until the appearance of anatomically modern humans for the first polished bone tools to emerge. However, Aterian humans were known to work bones. All of this does not negate the idea that

bone fragments bearing shapes resembling bone tools have been found, or perhaps were used as bone tools. This is evident in some sites, such as in the Mousterian level at *Wadi el-Akarit*, where bone fragments with imprints or perforations were found, which were likely used as pressure flakers. Some of them are polished only at their ends, indicating clear wear marks, while others bear wide cracks or small bundles of parallel lines. The most important of these bone remains were found in the Aterian layers (Alubruge site in *Hydra*, near Algiers), excavated by the National Center for Anthropological and Prehistoric Research from April to June 1960. These were not classified as bone tools, or perhaps they were the initial signs of this industry.

Some of them bear traces of sharp tools originating from the long bones of large animals, where they have been damaged, making it difficult to determine which part of the skeleton structure they belong to. Additionally, a single bone body of a camel was found, showing signs of simple slaughter. We will focus on three bone pieces: the first is a bone from the metacarpal of a deer, which has been cut vertically. Studies have revealed that this bone may have been subjected to percussion, with the aim of extracting marrow. If this was the prehistoric human's intention, we would expect to find many broken bone fragments in this shape at the site, rich in bone

remains. Another bone fragment bears deep and continuous incisions that cannot be confused with slaughter marks. As for the third piece, it holds significant importance. It is the lower second molar of a left-handed individual, bearing seven parallel cracks undoubtedly of human origin. These pieces, discovered at the Aterian site, revealed the beginnings of bone industry attributed to a human older than the Iberomaurusian or Capsian humans (Camps-Fabrer, 1966, p. 19).

III- The use of bones in North Africa during the Iberomaurusian and Capsian periods:

Morel, in 1976, affirmed that the bone industry would become evident in North Africa with the Iberomaurusian and Capsian humans (Kherbouche, p. 213).

The classification of bone industry in North Africa during the Upper Paleolithic, Neolithic, and the dawn of history was divided by researcher Camps-Fabrer into 54 categories, based on various criteria including their external shape, their farthest and nearest ends, their function, and the technique of their formation. Consequently, the Specialist was able to divide these tools into five distinct groups:

1. Group of Cutting Tools (Groupe des tranchants): Includes categories 1 to 9.
2. Group of Smoothing Tools (Groupe des mousses): Encompasses categories 10 to 17.
3. Group of Piercing Tools (Groupe des perforants): Comprises categories 18 to 48.
4. Group of Sickles (Groupe des fauciles): Represents category 49.
5. Group of Ornamental Elements (Groupe des éléments de parure): Encompasses categories 50 to 54.

The first group: Cutting Tools

Group of Cutting Tools **:** These tools were first identified by P. Cadenat. They are mostly elongated tools, except for the comb (peigne). This group is characterized by the presence of a cutting edge, either at one end or along one of the edges. If the cutting edge is at one end, it can be:

- paring-knives
- potter's combs
- chisels
- Pellets:

If the cutting edge is on the edge, it can be either:

- knives

- potters scapers

As for the cutting edge itself, it could be either:

- Straight:

  - Paring-knives with Straight chisel edges
  - chisels
  - knives

- oblique:

  Paring-knives with oblique chisel edges

- Curved :

  - Paring-knives with concave chisel edges.
  - Potter's scapers

IV- Techniques and stages used in shaping tools:

1. **Debitting and polishing one long bone shaft (**Débitage et polissage d'un fût d'os long)**:** This involves debiting and polishing a long bone to prepare it for further shaping.

2. **Design by beveling** (Aménagement par biseautage): After shaping the bone, a cutting edge is prepared either at one end or along one of its long rimss using beveling or polishing.

Biseautage: Cutting obliquely: It is said to be hollowed out or beveled.

V- definition of tools:

1- Paring-knife : Bone artefact, usually allongated, except for the potter's comb Flat and long bone tools with a cutting edge (beveled edge) at one end. They are divided into 3 categories:

1-1 Paring-knife with Straight chisel-edge : These are flat and long bone tools with a straight cutting edge (beveled edge) at one end.

Such tools are found at the Tamar Hat site in Bejaia and

date back to the Iberomaurusian period.

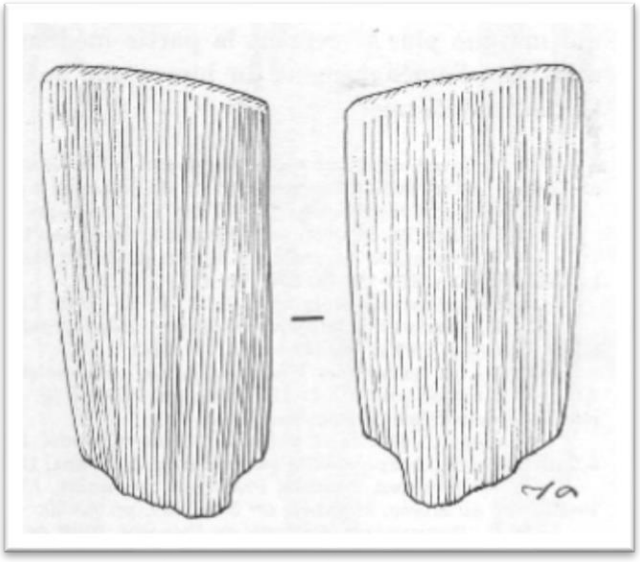


Image 1: Paring-knife with Straight chisel-edge

1-2 Paring-knife with oblique chisel-edge :

Flat and long bone tools bearing a beveled edge, inclined at the end.

These are found in the Epipalaeolithic sites at Columnata in

Tiaret, and the Boscoreale site in Morocco.

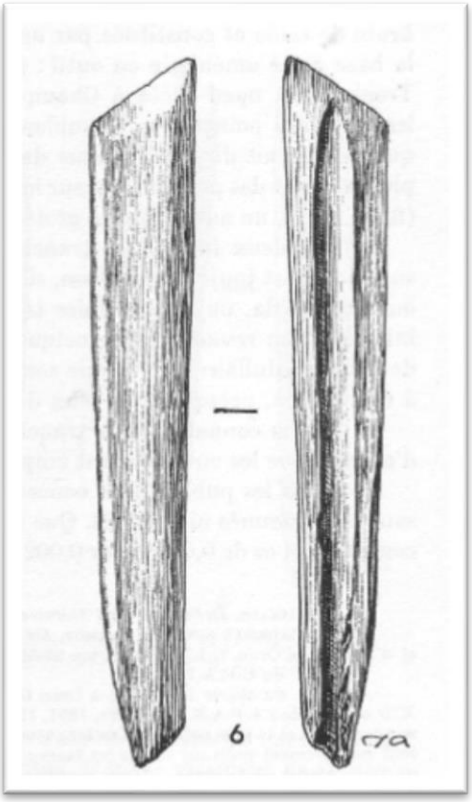


Image 2: Paring-knife with oblique chisel-edge

1-3 Paring-knife with concave chisel-edge and lateral spur :

Flat and long bone tools bearing a concave-edged cutter at one end, starting from one side of the tip and ending with an elongated projection.

These are found in sites such as Kef el-Kerem, Columnata, Grotte de Ain Gueddara, and Oued Tlata.

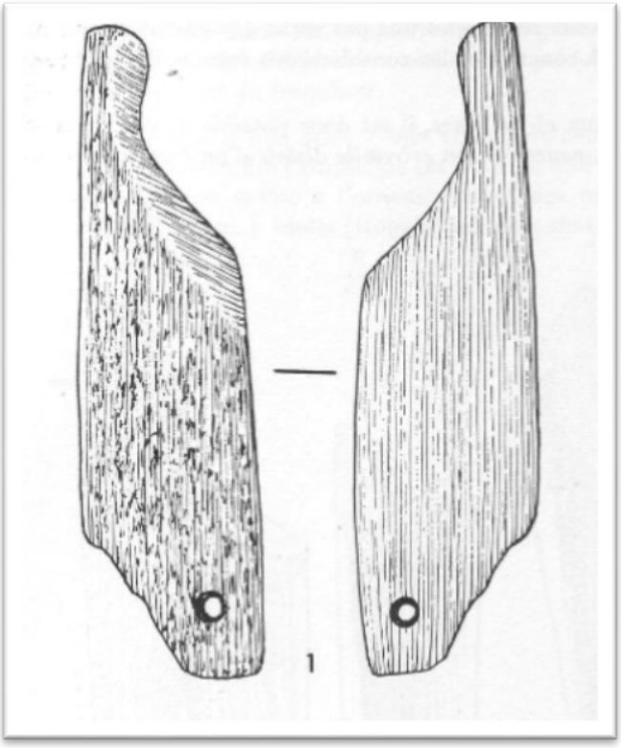


Image 3: Paring-knife with concave chisel-edge

2- knife

R. Vaufrey was the first to give the name *Saxon* to these tools

These flat and sharp-edged bone tools were crafted on the rib and shoulder bone. They are divided into 3 categories:

2-1 Knife with thick natural back.

Flat and long bone tools made on the shoulder blade or part of the pelvis, bearing a cutting edge on one of their edges, while the second edge remains natural.

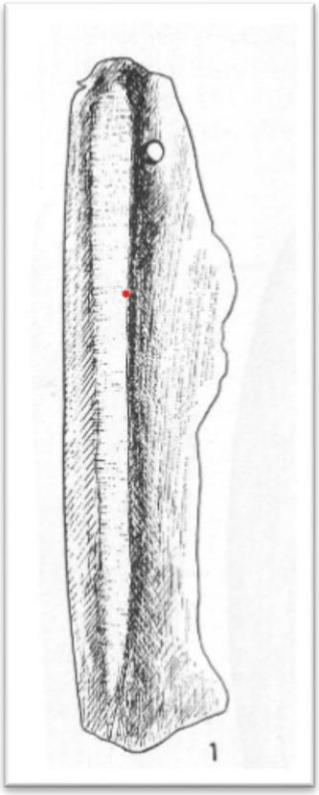


Image 4: Knife with thick natural back

2-1 Flat knife :

Flat and long bone tools made on a rib or a bone fragment, bearing a cutting edge on one of its edges, while the other is polished when the fragment is used.

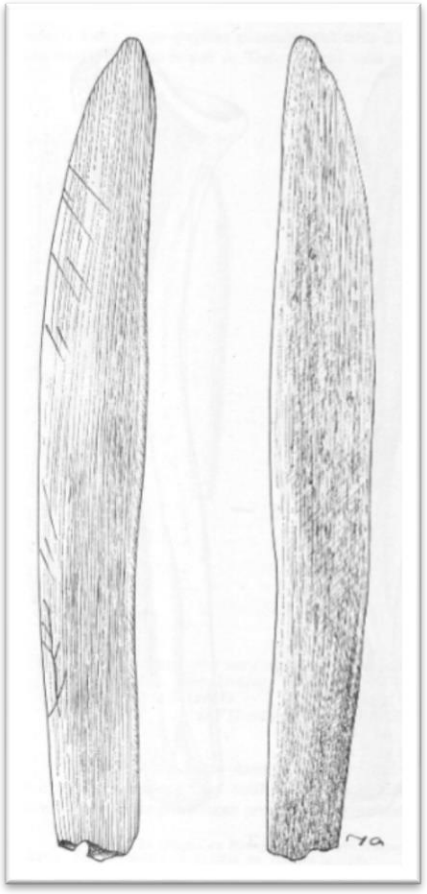


Image 5-1 Flat knives made on a rib

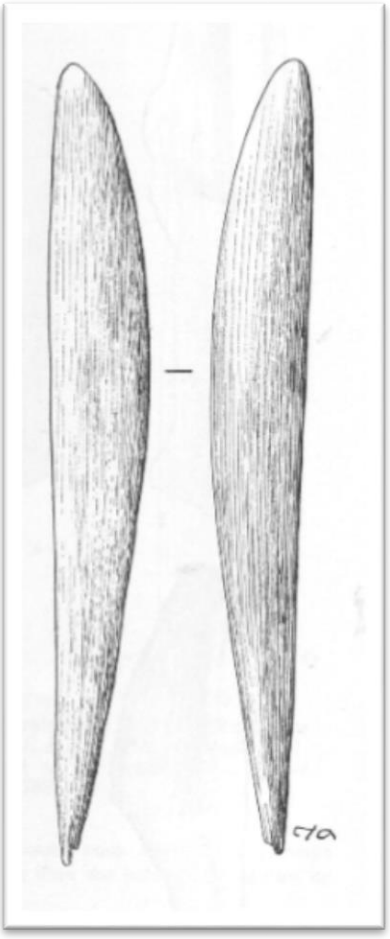


Image 5-2 Flat knives made on a bone fragment

3. Potter's scraper :

Flat and long bone tool bearing a cutting edge on one of its edges, with a concave curvature.

These tools are found among potters in the Kabyle region but are made of wood. All the sites where these tools are found belong to the Neolithic period.

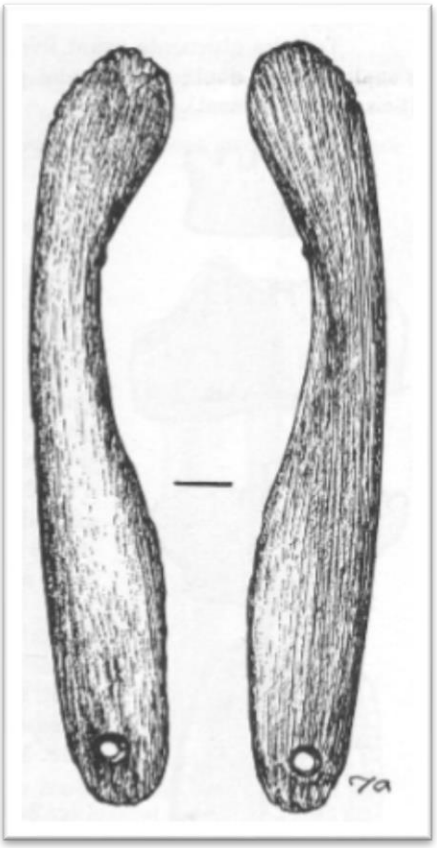


Image 6 : Potter’s scraper

4. Potter’s comb :

A flat and polished bone tool equipped with serrations along one of its edges, which are usually regular and sharp. These tools are used

for pottery decoration pottery. They are found in North Africa but not in Dar es Sultan (morocco).

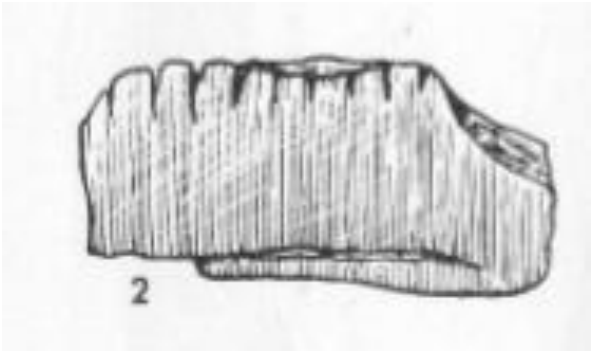


Image 7: Potter's comb

5. **The chisel (ciseau) :**

The chisel is a long, rough, and sturdy tool, bearing on its farthest part a slanting edge used for knocking or grooving, with no signs of polishing as found in chisels. In North Africa, these tools are commonly found in such sites: Columnata ; la cale génoise ; kef el-agad ; bou zabaouin ; djebel fertas.

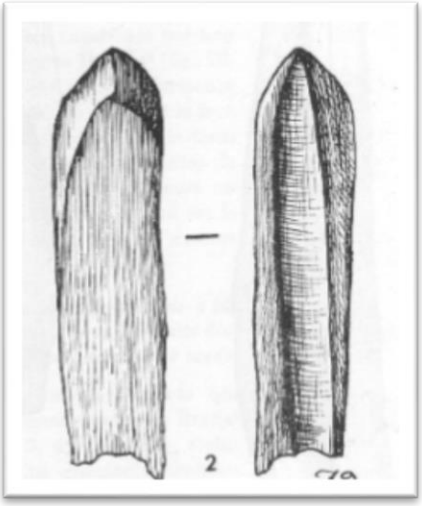


Image 8: The chisel

6. pellette

Dr. A. Cheynier identified it as a long, flat, and polished bone tool with a variable cross-section, always ending in a narrow and flat sharpened and tapered end.

This type of tool has been found in Hyena Caves and Bear Caves.

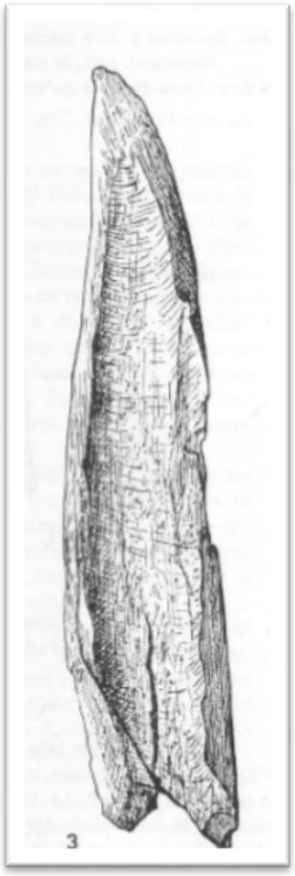


Image 9: pellette

V-2 **The second group: The Blunted tools :** Consists mainly of

- smoothers (nos: 10, 11, 12)
- Little stick (no: 13)
- burnisher (no: 14)
- spatula (no: 15)
- spoon (no: 16)
- blunted bone fragment (no: 17)

Definition of the tools: These are tools formed from long bone structures; unlike the first group, this group is characterized by the absence of a cutting edge at the farther end, and they contain a smooth or blunt surface.

1- **The smoothers:** Long bone tools characterized by the absence of a cutting edge at their farther end, which is always rounded and polished, extending to one or both edges. They are commonly found in North Africa. The various shapes found in this category allow us to identify three types of smoothers.

1-1 thick smoothers with a circular or sub-quadrangular section :

Long, polished bone tools, somewhat rough, with rounded edges, their thickness is always greater than 5mm, and their farther end are rounded and polished.

This industry is found among various civilizations The Iberomaurusian. The Capsian, and in the Neolithic civilisation : Medjez 2; Mechta el Arbi.

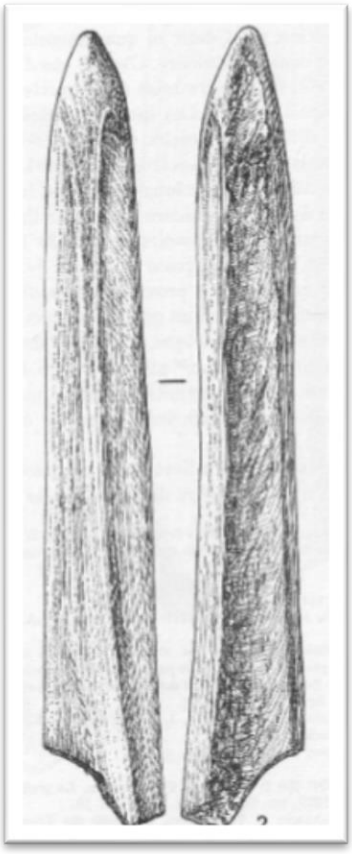


Image 10: thick smoothers with a circular or sub-quadrangular section

1-2 The flat and elongated smoother with rounded extremity :

The flat and elongated burnishers with rounded extremity: are Long, flat, and polished bone tools, having a thickness of less than 5mm, and their width mostly reaches 2cm, they have parallel edges and their farthest end in the shape of a circular arc.

This industry is found among various civilizations The Iberomaurusian, Capsian, and in the Neolithic. The presence of these tools is noted at the sites: Kef el-Kerem; El-Mekta; Khengel el-Mouhaad.

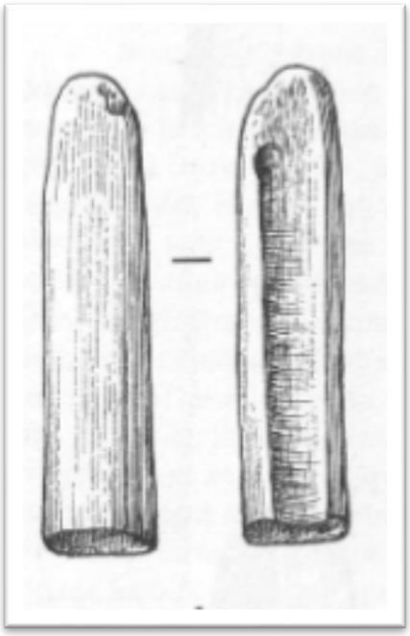


Image 11: The flat and elongated smoother

1-3 flat, elongated smoother with ogival extremity:

Long, flat, and polished bone tools, with a constant thickness and width along the edge of the tool, with parallel edges that meet at the far end to form a dihedral angle. These tools are found in Neolithic sites, including Columnata, Khenguet, Redyef

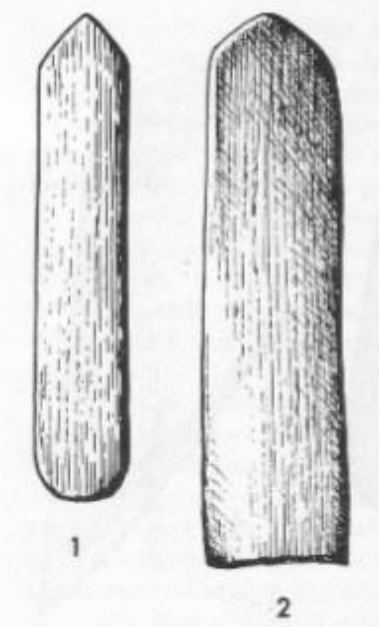


Image 12: flat, elongated smoother with ogival extremity

2- Little stick:

Long bone tools with parallel and well-polished edges, and rounded ends, slightly swollen on their upper face, their width is always less than 10mm, and most of these tools have a hole. They are found at Upper Capsian sites such as Mechta El Arbi, Lalla, Columnata, and other sites, all dating back to the Neolithic: Grotte des Ours, Djebel Merahsel, Bou Zabaouin..

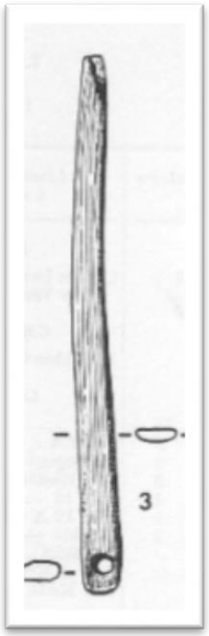
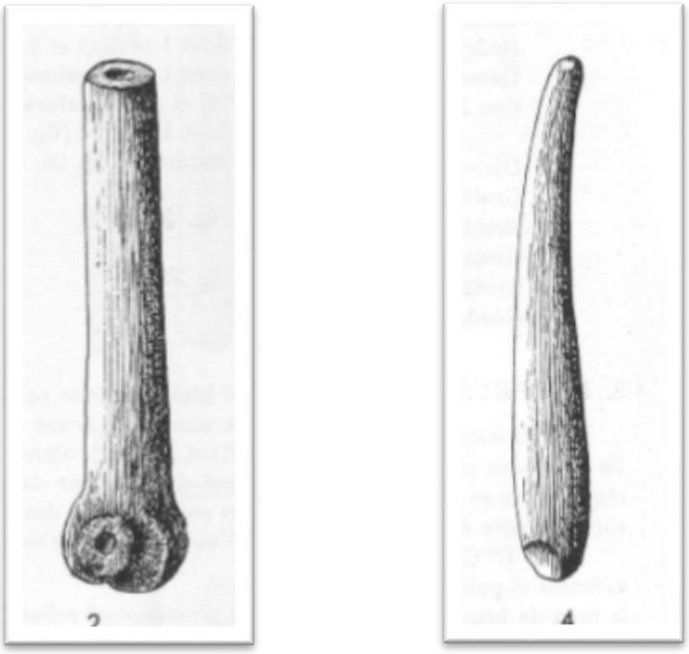


Image 13: Little stick

3- Burnisher :

Rough tools with variable lengths, with a nearly uniform stem, their farther end is truncated, slightly swollen with smoothed edges.

They are found at Iberomaurusian sites such as Afalou Bou Rmel, Ain Kéda, Bou Zabaouin, Khenguet Si Mohammed Tahar...



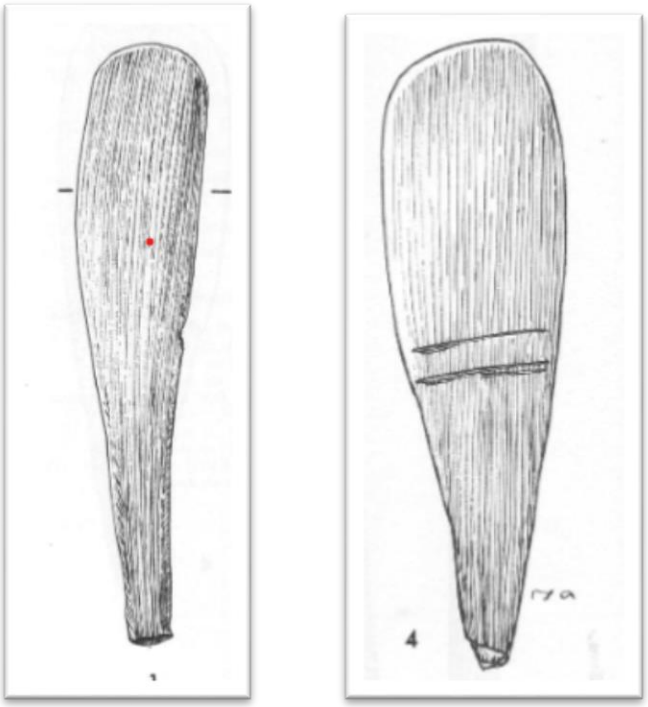
1 2

Image 14 (1, 2) : Burnishers

4- Spatula:

A.Cheynier defined the spatula as a flat bone tool with a rounded and smoothed end, narrow for a third of its length and then widening. Its thickness remains constant along the tool's length.

They are found at some Neolithic sites: Redyef, Kef el-Agab, Grotte du Damous Elahmar...



1 2

Image 15 (1,2) : Spatulas

5- spoon:

A long, flat bone tool, slightly thin, with a concave upper face and smoothed edges.

They are found at sites such as La Caverne des Idoles à Achakar and Grotte d'El Araouia.

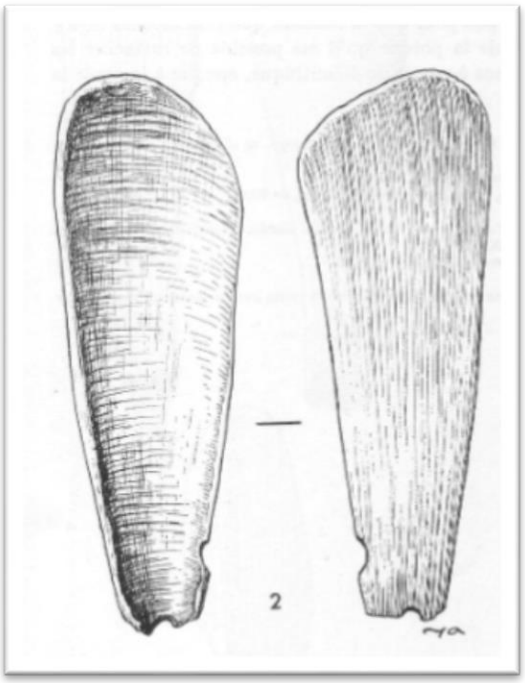


Image 16 : Spoon

6- Blunted bone fragment :

Thin and light bone fragments, their thickness does not exceed 2mm, which makes them fragile, their upper face is well polished, their edges are smoothed, and their farthest end is thin.

We find this industry in the Upper Capsian at sites such as Ain Kéda, Columnata, and Mechta El Arbi.

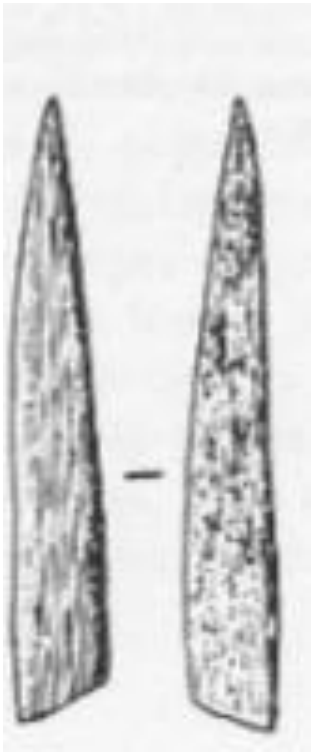


Image 17: Blunted bone fragment

V-3 The third group: Perforating artefacts :

Their main feature is that all tools in this group have a pointed end. Some of them are related to sewing and leatherworking, possibly in basket weaving, while others are used for decorating pottery, in addition to tools for hunting and fishing. We find this industry among the Iberomaurusian, Capsian, and in the Neolithic civilizations.

They consist mainly of:"

- awls (nos: 18 to 30)
- Thin awls (no: 31)
- Pins (nos: 32 to 35)
- Needles (nos: 36 and 37)
- Nib (no: 38)
- Fish-hooks (nos: 39 to 41)
- Harpoon head (nos: 42 to 46)
- Assagai point (no: 47)
- Daggers (no: 48)

- **Awls:**

Bone tools characterized by a pointed end, with a diameter always greater than 3mm and a length less than 18cm. The variation in these tools lies not in their pointed part but in the cross-section of their stem.

1-1 Rough awl:

A bone tool shaped on a bone fragment or on the bone of some small mammals. Its characteristic is that its end is polished only a few centimeters adjacent to the pointed end.

Found at sites such as Oued Kerma (Iberomaurusian), Bou Nouara (Upper Capsian), and Guartel (Neolithic).

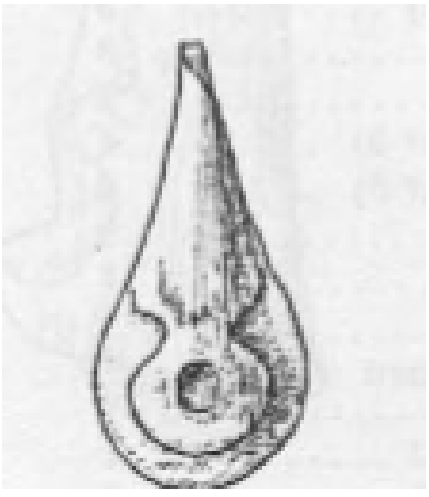
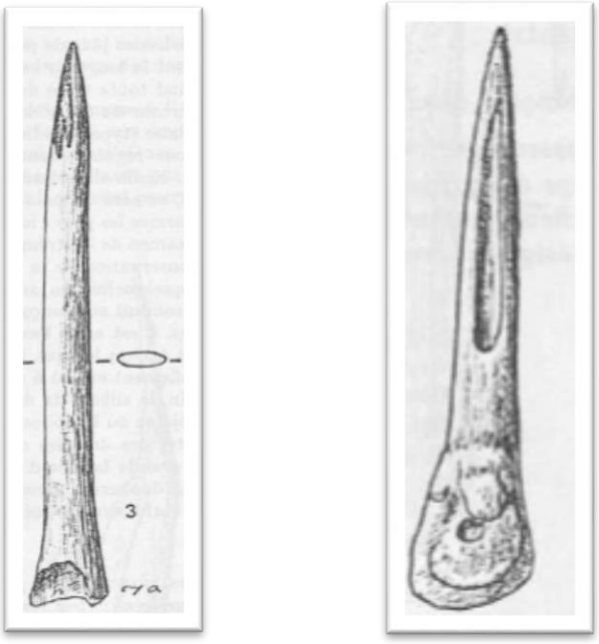


Image 18: Rough awl

1-2 Awl with epiphysis:

A bone tool shaped on long and complete bones of some small mammals. Its farthest end is broken and polished to form a point, while the nearest end retains its natural end.

We Find this tools at sites: Le Mesloug (Upper Capsian); Djebel Marhsel (Neolithic)



1 2

Image 19 (1,2) : Awl with epiphysis

1-3 awl in bone taken from split lenghtwise:

A solid and sturdy punch shaped from a long bone that is longitudinally split until its joint, partially preserved.

Found at sites such as Tamar Hat (Iberomaurusian); Abri Clariond (Typical Capsian); Mechta El Arbi (Upper Capsian); Damous El Ahmar (Neolithic).

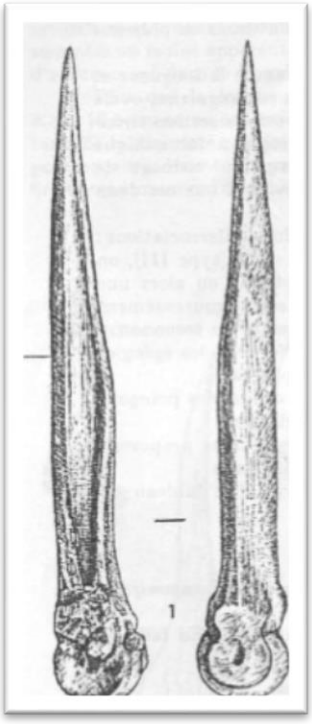


Image 20 : awl in bone taken from split lenghtwise

1-4 Awl made from a splinter of long bone with incompletely polished proximal extremity :

Pointed tool formed on a medium-sized bone splinter. The splinter is polished along its stem but not at its proximal end, and the polishing is not sufficient to hide the bone marrow channel.

Found at sites such as Tamar Hat (Iberomaurusian), Redeyef (Typical Capsian), Ain Dokkara (Upper Capsian), Kef el-Agab (Neolithic).

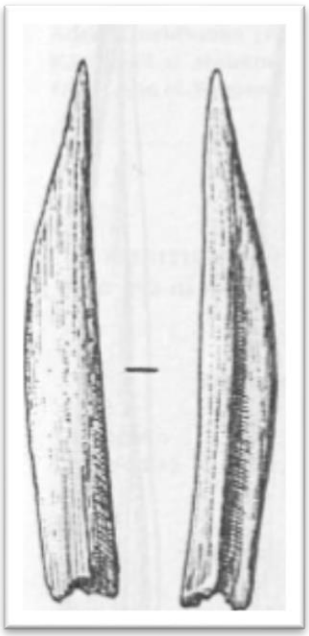
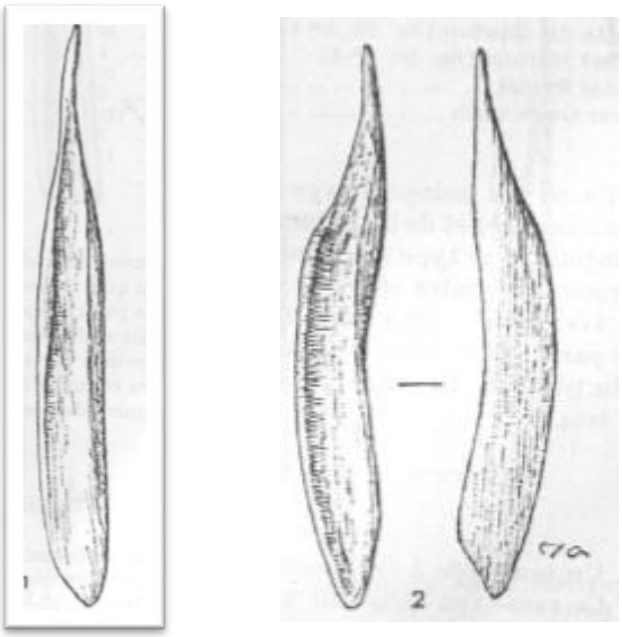


Image 21 : Awl made from a splinter of long bone with incompletely polished proximal extremity

1-5 Stiletto-tipped awl :

Pointed tool formed on a medium-sized bone splinter. The splinter is polished along its stem, but the polishing is not sufficient to hide the bone marrow channel. Its proximal end is flat, while its distal end terminates in a sharp, elongated point comes like a tongue.

Found at sites such as Le Mouillah (Iberomaurusian), Medjez2 (Upper Capsian), Polygone (Neolithic).



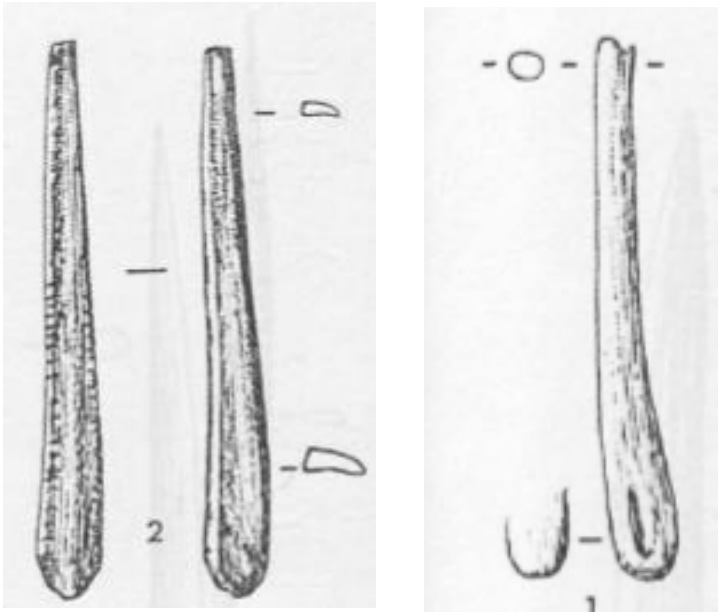
1 2

Image 22 (1,2) : Stiletto-tipped awl

1-6. Awl made from a splinter of long bone with a rounded proximal extremity:

Pointed tool formed on a medium-sized bone splinter. The splinter is polished along its stem, but the polishing is not sufficient to hide the bone marrow channel. Its proximal end is rounded.

Found at sites such as Champlain (Iberomaurusian), Medjez 2 (Upper Capsian), Kef el-Agad (Neolithic).



1 2

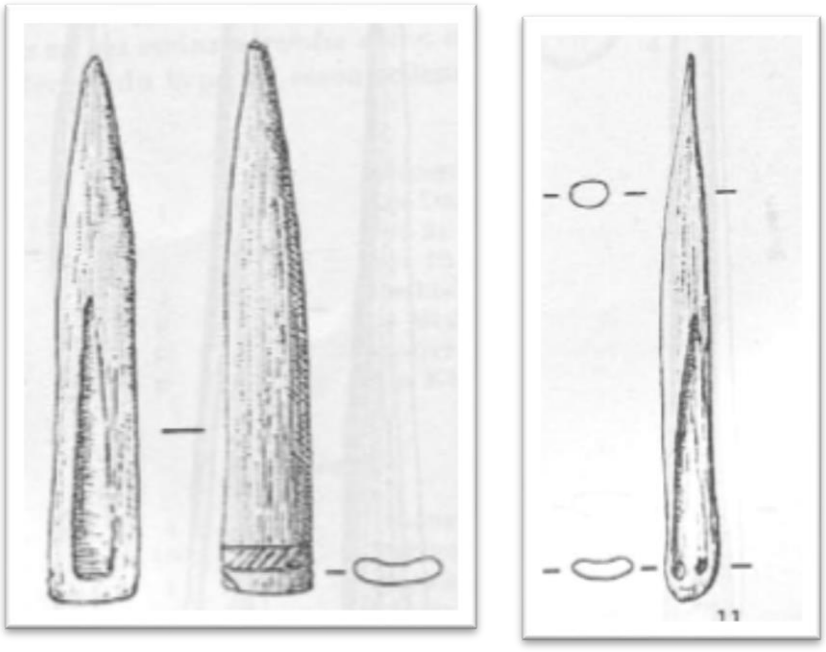
Image 23(1,2) : Awl made from a splinter of long bone with a rounded proximal extremity

1-7 Awl with thinned proximal extremity:

Pointed tool formed on a medium-sized bone splinter. The splinter is polished along its stem, but the polishing is not sufficient to hide the bone marrow channel.

Its proximal end is flat with a sharpened edge, to be used as a cutting edge if sharp or as a burnisher if smoothed.

Found at sites such as Champlain (Iberomaurusian), Mechta el-Arbi (Upper Capsian), Redyef (Neolithic)



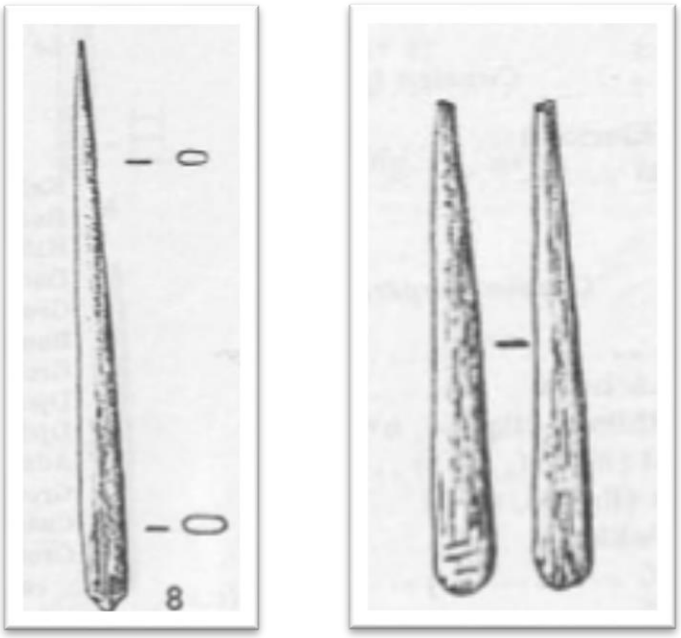
1 2

Image 24(1,2) : Awl with thinned proximal extremity

1-8 Completely polished awl with a stock of rectangular, oval or triangular section:

Pointed tool formed on a well-polished bone splinter, hiding the marrow channel. It has a rectangular, oval, or triangular section. Its proximal end is polished but never flat.

Found at sites such as Champlain (Iberomaurusian), Abri Clariond (Typical Capsian), Rfana (Upper Capsian), Kef el Agad (Neolithic).



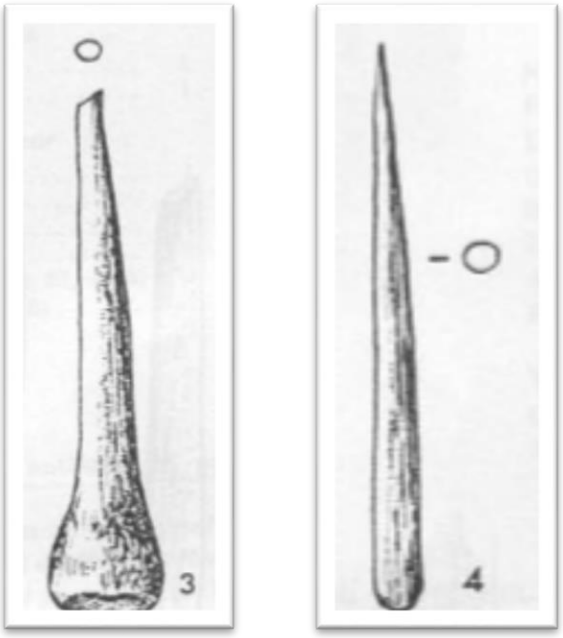
1 2

Image 25(1,2) : Completely polished awl with a stock of rectangular, oval or triangular section

1-9. Awl with conical sotck:

Well-polished pointed tool, hiding the marrow channel, with a conical shaft. Its circular section gradually increases from the pointed end to its proximal end.

Found at sites such as Oued Kerma (Iberomaurusian), Abri Clariond (Typical Capsian), Lalla, Relilai (Upper Capsian), Redyef (Neolithic).

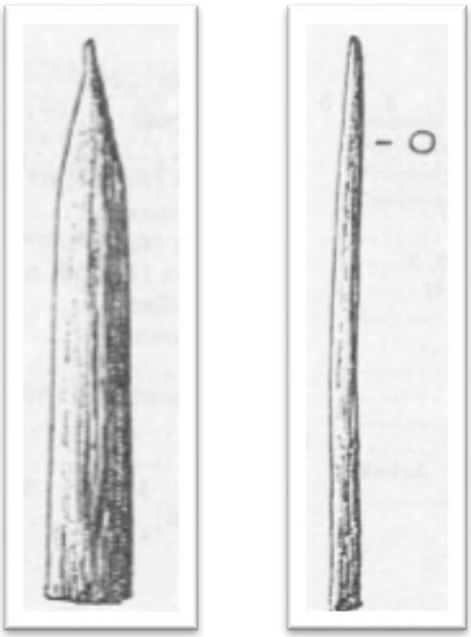


1 2

Image 26(1,2) : Awl with conical sotck

1-10. Awl with cylindrical stock:

Well-polished pointed tool with a cylindrical shaft, with its section remaining constant directly below the pointed end to its proximal end. Found at sites such as Champlain (Iberomaurusian), Hamda (Upper Capsian), Kef el-Agad (Neolithic).



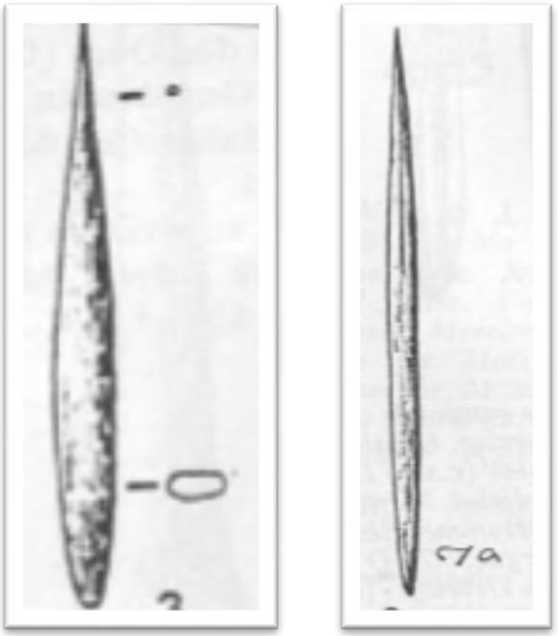
1 2

Image 27(1,2) : Awl with cylindrical stock

1-11 Awl with curved stock:

Well-polished pointed tool with a convex and swollen shaft in its middle, where the diameter of its ends is always smaller than the diameter of its shaft.

Found at sites such as Tamar Hat (Iberomaurusian), Mechta el Arbi (Upper Capsian), Kef el-Agad (Neolithic).



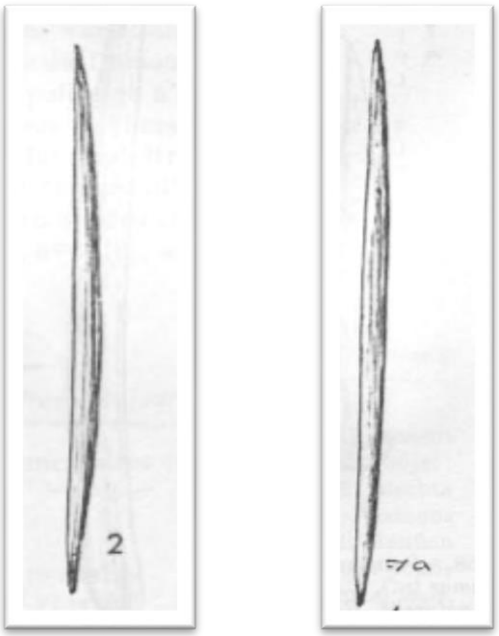
1 2

Image 28 (1,2) : Awl with curved stock

1-12 Double tipped awl :

A well-polished bone tool, both of its ends are pointed but inconsistent.

Found at the sites: Ain Dokkara (Capsian Upper) Damous el-Ahmar (Neolithic)



1 2

Image 29(1,2) : Double tipped awl

1-13 Awl with Non-rectilinear stock :

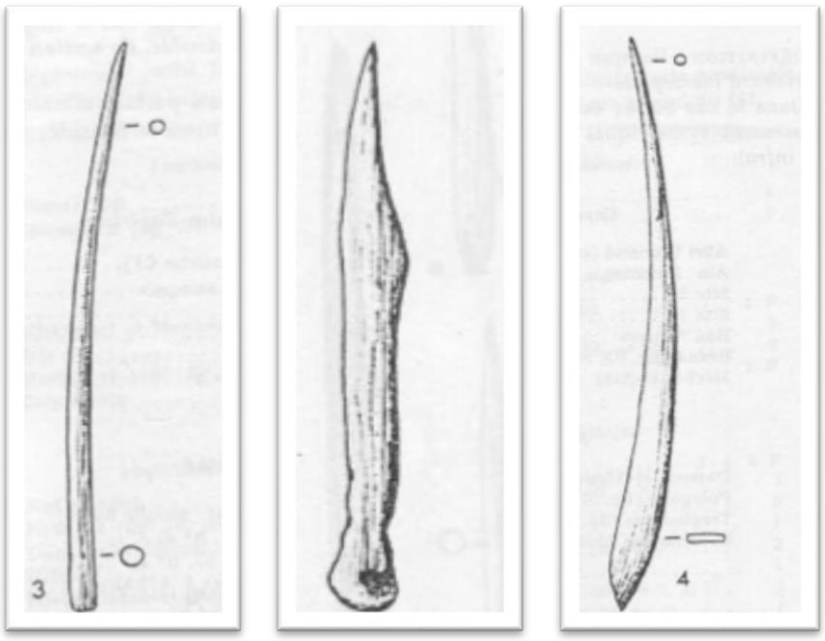
A puncture tool with an irregular shaft, which can either be:

a/ bent point

b/ Stock bearing ridges where polishing couldn't remove them

c/ Incurved stock .

Found at the sites: Abri Clariond (Typical Capsian) Ain Rhilane (Capsian Upper); Dalous el-Ahmar (Neolithic)



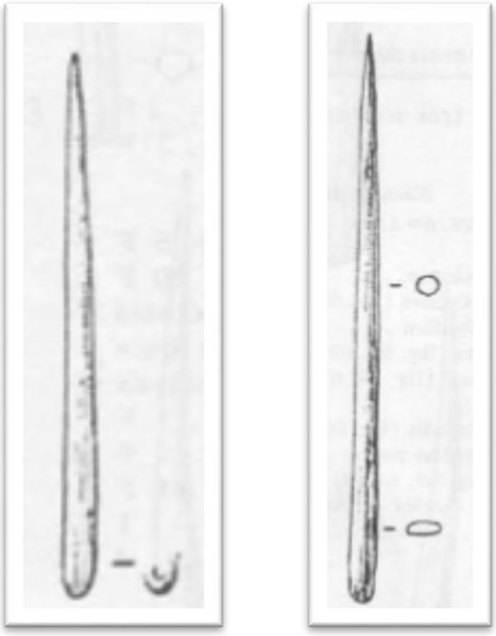
a b c

Image 30 (a,b,c) : Awl with Non-rectilinear stock

2. Thin Awl :

A very finely pointed, well-polished tool with a variable section and a diameter always less than 3mm. Most cases are found fragmented.

Found at the sites: of Abri Clariond (Typical Capsian); Ain Rhilan (Capsian Upper); Kiféne (Neolithic)



1 2

Image 31 (1,2) : Thin Awl

3. Pins :

A well-polished stem with a variable section with a polished tip or bulge at its proximal end This bulge varies from tool to tool:

3-1 – Bent-headed pin (Type 32)

Type 1

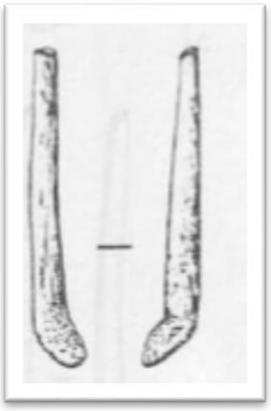


Image 32

3-2 Straight headed pin.

Type 2

Image 33

3-3 Pin with flat and elongated head

Type 3

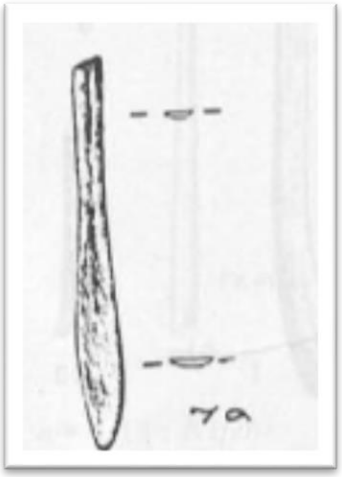


Image 34

3-4 Pin with a spherical head

Type 4

Image 35

You can find these objects at the sites mentioned in the table :

LES ÉPINGLES

Gisements	Epingles à tête déjetée	Epingles à tête droite	Epingles à tête plate et allongée	Epingles à bouton	Total
Ibéromaurusien					
Taforalt (niveaux II, III)				1	1
Capsien supérieur					
Hamda		1			1
Relilaï	3	4			7
Khanguet el-Mouhaâd	1	1			2
Mechta el-Arbi	3	1			4
Site 10		2			2
Site 51	1		1		2
Columnata	3			7	10
Néolithique			1		
Kef el-Agab	3		1		4
Redeyef				1	2
Damous el-Ahmar	3	1	1		5
Djebel Fartas					1
Djebel Marhsel	1				1
Bou Zabaouine			1		1
Mouflon	1			1	2
Grotte des Hyènes		1			1
Adrar Guelduman				1	1
Noiseux		1			1
Troglodytes	1				1
Cav. des Idoles à Achakar				3	3
Grotte d'el Khril				1	1

4. Needle :

Tools that fall within the category of awls used for sewing, and they are divided into two sections:

4-1 Needle with an eye :

An awl with a conical, cylindrical, or oval shaft, with a diameter not exceeding 8 to 5mm, and it is equipped with an eye at its nearest end. If its diameter exceeds 8mm, then it does not fall into the category of needles with holes.

You can find them at the sites: Adrar Gueldman; Bou Zabaouin...

Type 1

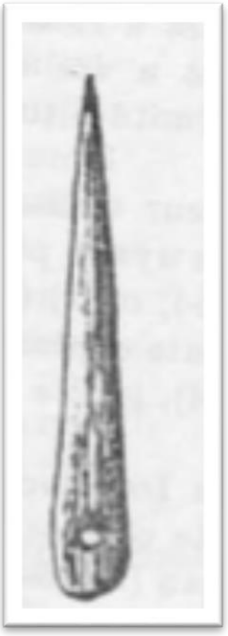


Image 36 : Needle with eye

4-2 Tubular needle :

Fashioned from hollow bird bone, its far end is cut with a sharpened edge, and the nearest end is open. It is used as a sewing tool, where the thread passes through the channel, serving the same function as the hole.

Found at the sites: Columnata; Grotte du Polygone

Type 2

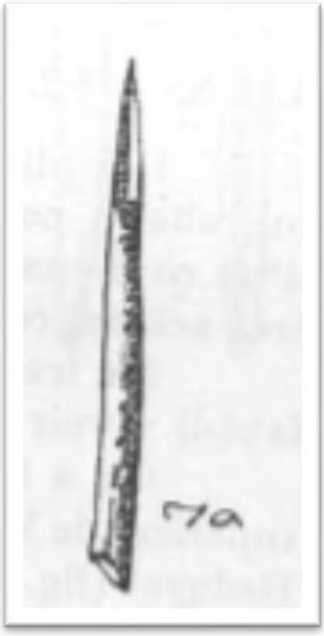


Image 37 : Tubular needle

5. Nib :

Resembles greatly the needle with channel, but there is no continuity in the medullary channel where the natural end of the bone is preserved. These tools are also made on split hollow bones, where the far end is long and pointed, and polished.

Found at the sites: Redyef; Bou Zabaouin; Tamar Hat...

Image 38 : Nib

6. Fish-hook

6-1 Straight Fish-hook :

Consists of well-polished double punctures with a circular section, where the two pointed ends are strictly symmetrical. Humans use it for fishing by attaching it to a thread and when the fish swallows it, the pointed ends pierce its flesh, facilitating its capture.

Found at the sites: Champlain (Ibero); Kef el-Agad (Neolithic); Mechta el Arbi (Capsian S)

Type 1

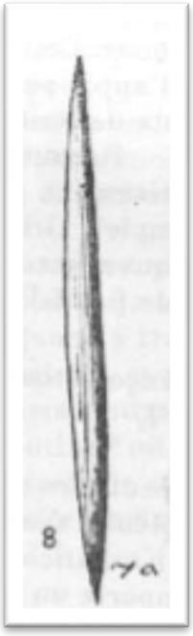


Image 39: Straight Fish-hook

6-2 Straight Fishhook with Groove :

Consists of a double puncture, with symmetrical or non-symmetrical pointed ends, bearing a somewhat thin and deep groove along the length of the tool for holding the thread and bait.

Type 2

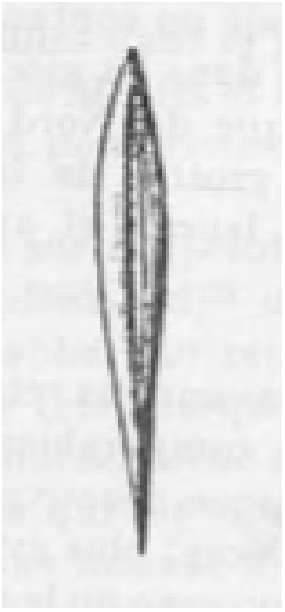


Image 40: Straight Fish-hook with Groove

6-3 Bent Fish-hook :

A tool made of polished bone with a round section, shaped like a hook, one end of which is more curved than the other and pointed. Known in many Neolithic sites in North Africa.

Found at the sites: Karkarichinkat; Ain Guezzam...

Type 3

Image 41: Bent Fish-hook

7. Harpoon Head :

A projectile weapon where the handle separates directly when the pointed extremity penetrates the animal's body. It is made of long, pointed bones, with a variable section, bearing barbs in one or both edges.

These tools are found at the site of Taforalt; Khenget el Mazouj.

These tools vary according to the form of their base:

7-1 Harpoon Head With a conical or circular smooth base (type 42)

Type 1

Image 42

7-2 The harpoon head with grooved heel (type 43)

Type 2

Image 43

7-3 The harpoon head with perforated heel (type 44)

Type 3

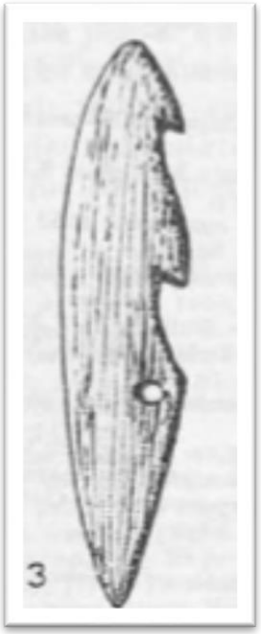


Image 44

7-4 harpoon head with swelling on the heel (type 45)

Type 4

Image 45

7-5 harpoon head with notched heel (type 46)

Type 5

Image 46

8. Assagai point :

Artefact in polished bone, of oval section, the diameter of which is always superior to 1cm, and with a head point. In spite of polishing, the lower surface generally retains the trace of the medullary canal

It's a weapon for throwing, it may undergo a process of burning to gain hardness and resistance.

We find it at the sites: Champlain (IBM); Hamda (Capsien S);

Oued Saida (Neo).

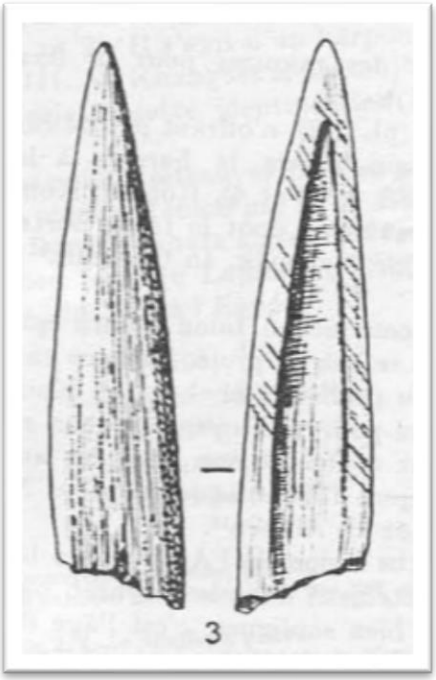


Image 47

9. Dagger :

Artefact in polished bone of circular, oval or flattened section, the length of which is always superior to 18 cm, provided with a hard point more or less tapered

We find it at the sites: of Meskiana; Mechta El-Arbi; Khanguet Si Mohamed Tahar...

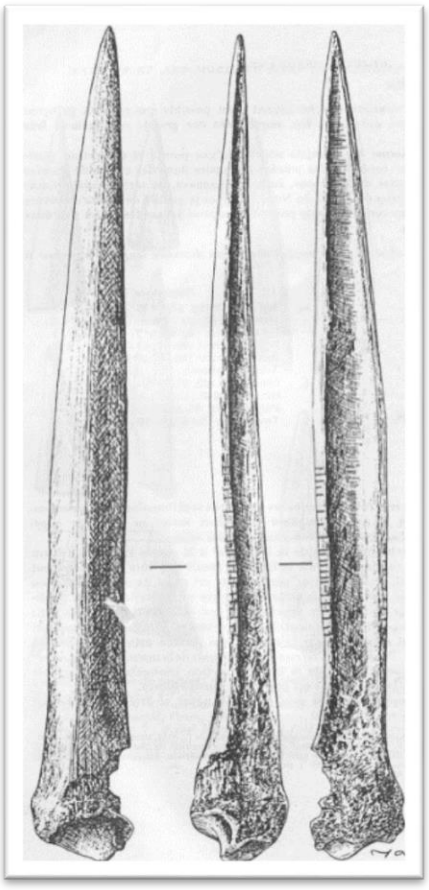


Image 48

V-4 Fourth groups : Group of sickles.

Sickle Hand :

Artefact in bone, usually made of long bones, commonly crafted from animal ribs, bearing a broad, long, and deep groove on one side. Its main purpose is to insert stone geometric microliths within this groove. In some cases, humans resort to reinforcing it with natural adhesives like the resin secreted by certain trees.

We find it at the sites: Mechta El Arbi; Neolithic cave of Polygone Relilai.

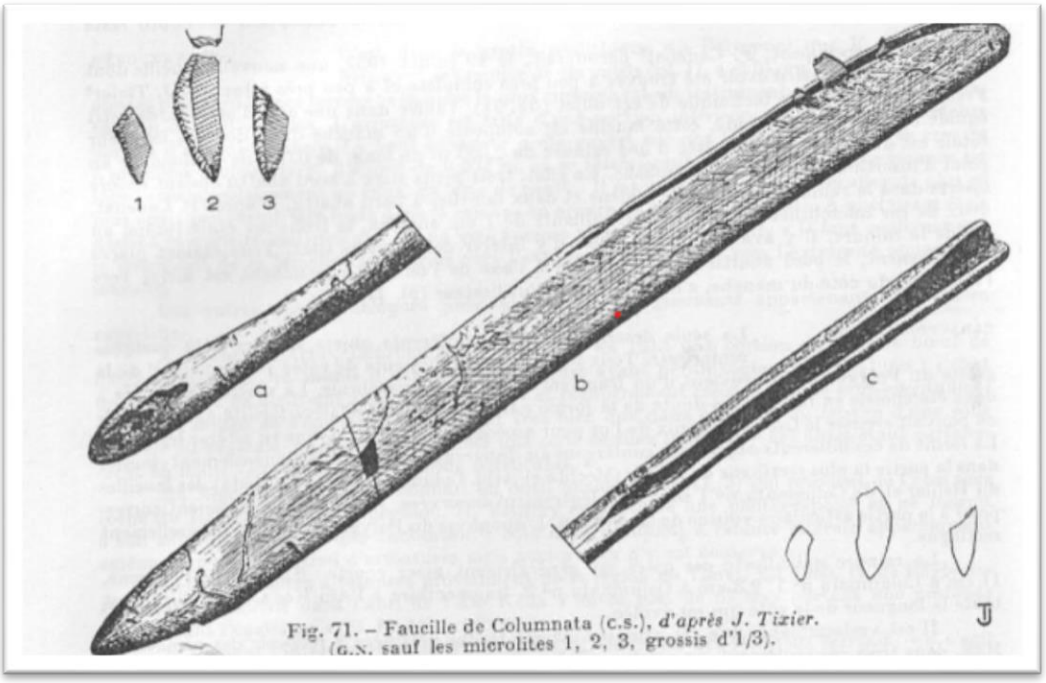


Fig. 71. – Faucille de Columnata (c.s.), *d'après J. Tixier.* (G.N. sauf les microlites 1, 2, 3, grossis d'1/3).

Image 49

V-5 Fifth group: Ornaments

Cutting up of hollow bird bones into more or less long fragments and polishing their extremity edges (tubes, tubular beads). Perforation of small bone fragments and polishing their contours (threading discs). Perforation of objects with rounded and perfectly polished contours (pendants). Debitage of polished cylindrical bone rods; polishing thestock and the surface of the extremity.

Consists mainly of :

- Bone tube
- Pendant
- Tubular bead
- Bead
- Lip-plug

1. Bone tube

Tubes made of bones: Humans use the long hollow bones of birds, spreading their extremity and polishing their edges, giving them a cylindrical tube shape with a length always greater than 5 cm and sometimes adorned with grooves for decoration.

We find them at the sites: Polygone(n) Mechta El Arbi (Capsian; Kifene (Neolithic).

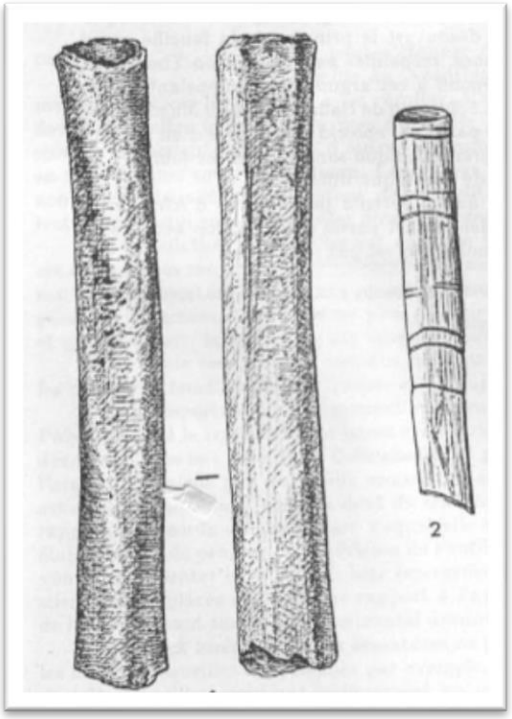


Image 50

2. Pendant :

Tool made of bones with varying shapes, characterized by one or more holes used for hanging. Sometimes these tools are made on other materials such as ivory, turtle shell, or even on the tusks of pigs or elephants.

We find them at the sites: Redeyef; Bouskoura; Mechta

Arbi...

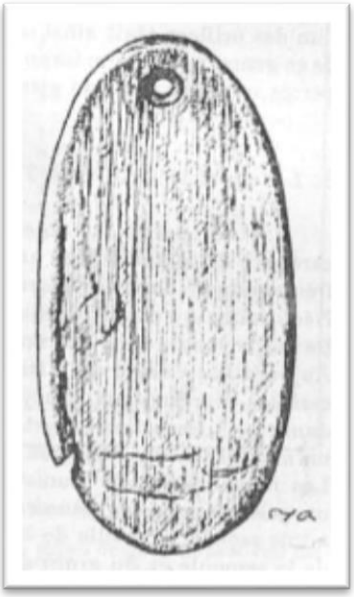


Image 51

3. Tubular bead:

Long beads made on hollow bones, pointed at both ends and well-polished along the edges, their length not exceeding 5 cm (more than 5 cm, they become bone tubes). These tools resemble awls, as the latter are made on bones.

We find them at the sites: Columnata; Djebel Marshel...

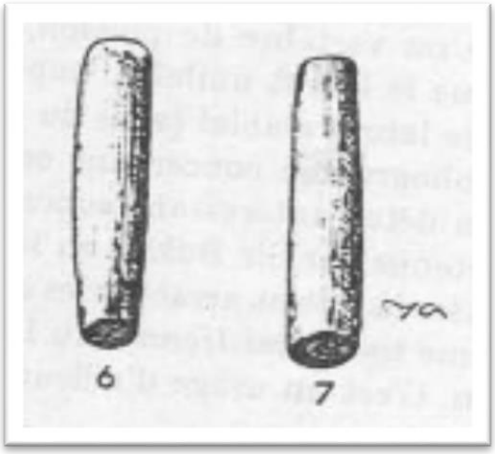


Image 52

4. Bead:

They consist of cutting flat and thin bone circles, then drilling them and adjusting their edges by polishing them well or obtaining them by slight transverse spreading for hollow bones, and the hole in this case is natural.

We find them at the sites: Ain Dokkara; Columnata...

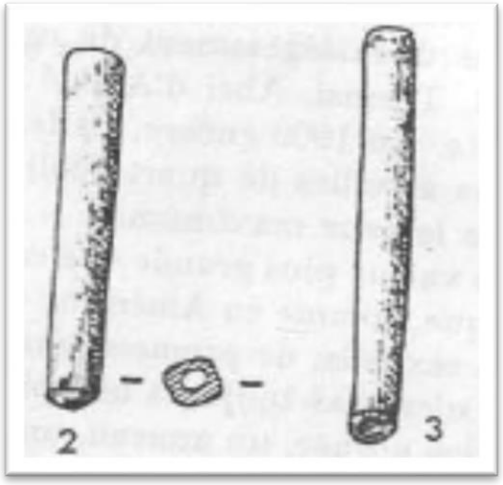


Image 53

5. Lip-plug

Solid bone splinters, cylindrical in shape and well-polished, where their extremities are flattened and then polished well. They are found in the desert. They are made of quartz and tapered at the extremity. They have a ritual dimension, where they are directly inserted under the lower lip after extracting the lower incisors. The purpose of this is to ward off diseases and evil spirits.

We find them at the sites: Cave of Djebel Marshel; Chad; Tilemsi...

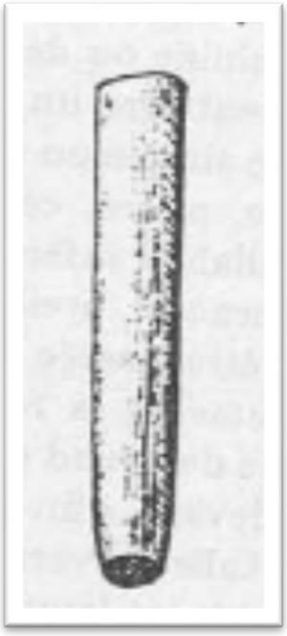


Image 54

VI- Taphonomy of bones

It is not always possible to recognize the anatomical origin of bones, as polishing has completely erased all elements allowing their identification. Therefore, they must be classified according to their shape and probable use.

So, in a problematic bone collection, the issue arises with identifying bones that have been intentionally worked compared to those that bear marks produced when they were butchered for food or simply due to natural causes (natural agents such as physicochemical processes that cause the loss of raw material or the destruction of the surface, as well as moisture, plant roots, tooth marks frequently from rodents, rolling by water—all these elements can cause the same marks that humans can make, which explains why some collections may be viewed with suspicion.

Bone tools are not easily identifiable; the problem lies in:

1/ The difficulty of distinguishing intentional human action from natural causes of fragmentation and alteration such as scavengers, atmospheric agents, and transportation.

2/ In human action, it is necessary to distinguish between simple bone fragmentation related to nutrition and their butchering and shaping to obtain proper tools.

Usage traces and stigmata generally seem easy to recognize and distinguish, and usage can be inferred from them. However, sometimes one can mistake natural actions for usage traces:

- Sediment pressure can break a bone without any intentional blows.

- The passage of herds of ruminants or the action of adult hyenas are comparable in their mechanisms and effects to intentional blows struck with a percussion tool.

- Proximal articulations of long bones are generally gnawed by scavengers.

- Fragments of diaphyses ending in points or sharp edges are found both in natural and intentional assemblages.

- They can come from food waste

- Simple fragments of bone or deer antler used raw

- Most of the time, very little elaborated

- No well-defined technique

The main marks observed under both microscope and SEM are grouped into three main types:

1. Grooves

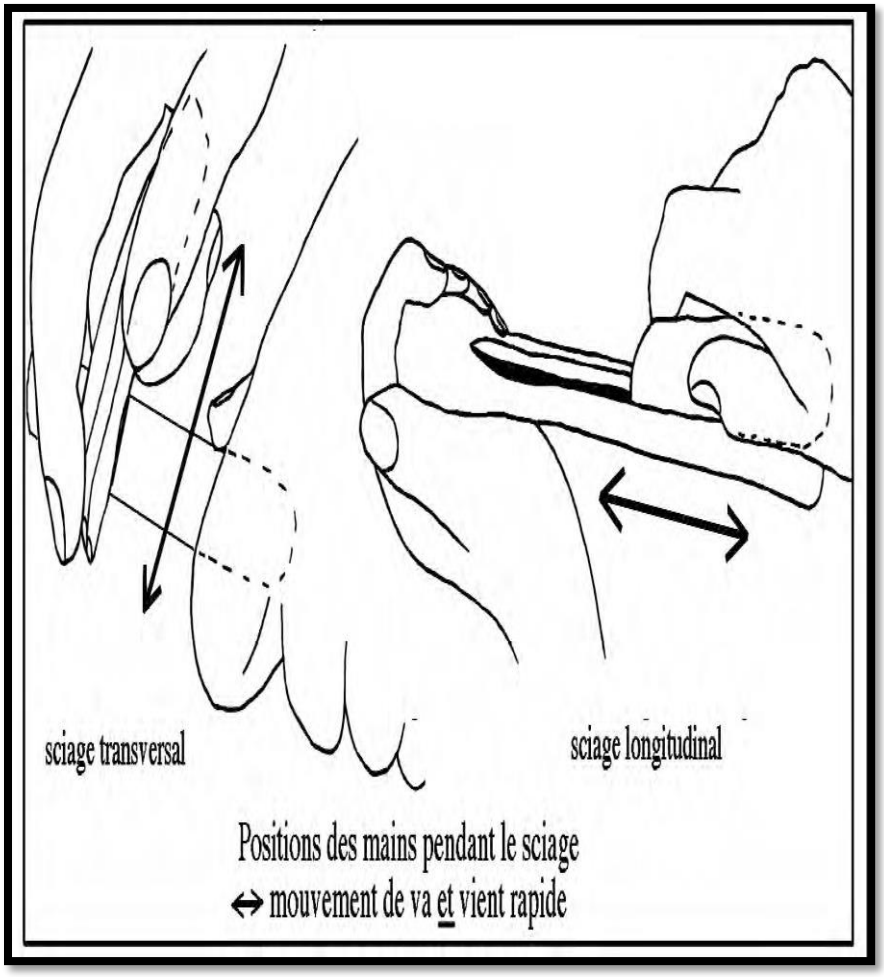
2. Other surface modifications

3. Perforations

1. Grooves:

1.1. Anthropogenic marks:

The grooves produced by the sharp edge of a lithic tool have a V-shaped section that is maintained along the length of the groove. The interior of the main groove is marked by secondary grooves (produced by the micro-irregularities of the edge).



The grooves produced by lithic tool

1.2. Vascular imprints:

The bone is traversed by vessels that leave groove-shaped imprints on the bone surface (resembling anthropogenic grooves). Their depth varies depending on the individual, bone type, and bone region. They have a rounded bottom.

1.3. Marks left by rodents:

- Rodent incisors act like a chisel.

- They trace two parallel grooves of regular width and depth, varying according to the size of the animal.

- They are usually located at the edges, on ridges, or at the ends of the bone.

1.4. Trampling marks:

Trampling causes the displacement of objects, fractures, and abrasion marks (due to the action of sedimentary components of the soil) on the particles sedimentary abrasives leave grooves on the surface of bones that cannot be confused with butcher's cut marks by the naked eye.

- The bottom of the groove is more or less flattened.

- Its profile changes shape along its length.

- Produced by the pressure and rolling of a particle sliding, so its point of contact varies during sliding and over time.

- It depends on the number and weight of the agents (responsible).

- It also depends on the nature of the particles.

1.5. Marks left by plant rootlets:

- Plant species produce carbonic acid and citric acid, which partially dissolve the bones they come into contact with.

- They leave vermicular imprints in the form of long filaments.

- The profile or cross-section of these vermiculations is U-shaped with a relatively wide flat bottom (some of these grooves have been interpreted as "artistic incisions").

1.6. Marks left by carnivores:

Carnivores leave several types of interventions on bones (fractures, gnawing, polishing, perforation, etc.).

Tooth marks are the most common traces.

- Tooth marks from young individuals produce rounded but narrower grooves.

Tooth marks from older individuals leave grooves with a wider and sometimes flatter bottom.

- Gnawing on a bone leaves pitting marks on the bone surface (small overlapping cupules that can lead to significant loss of material).

- Grooves caused by teeth are straight and elongated, with a cross-section varying from a U-shaped to a V-shaped profile and a relatively smooth and flat bottom.

- These parallel grooves are arranged in regularly spaced groups.

2. Other surface modifications:

2.1. Anthropogenic action:

- Scraping marks: Made by a lithic tool, leaving parallel streaks on the bone surface with each pass of the tool. Each pass erases the previous streaks.

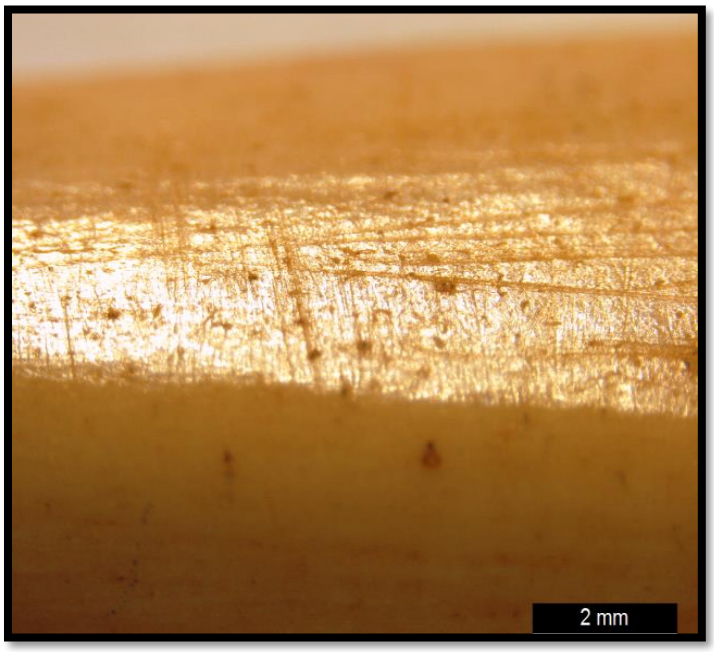
- The action of an abrasive piece produces streaks on the surface of the bone.

- The action of an abrasive piece produces streaks parallel to the direction of movement (oriented according to the direction of movement). These streaks appear with different depths and widths depending on the diameter of the abrasive particles and their projection.

- Abrasive particles leave interrupted streaks during abrasion.

- When the pass is made with a fine particle rock, the streaks are then of small width.

Scraping marks



polished object

2.2. Marks of transport:

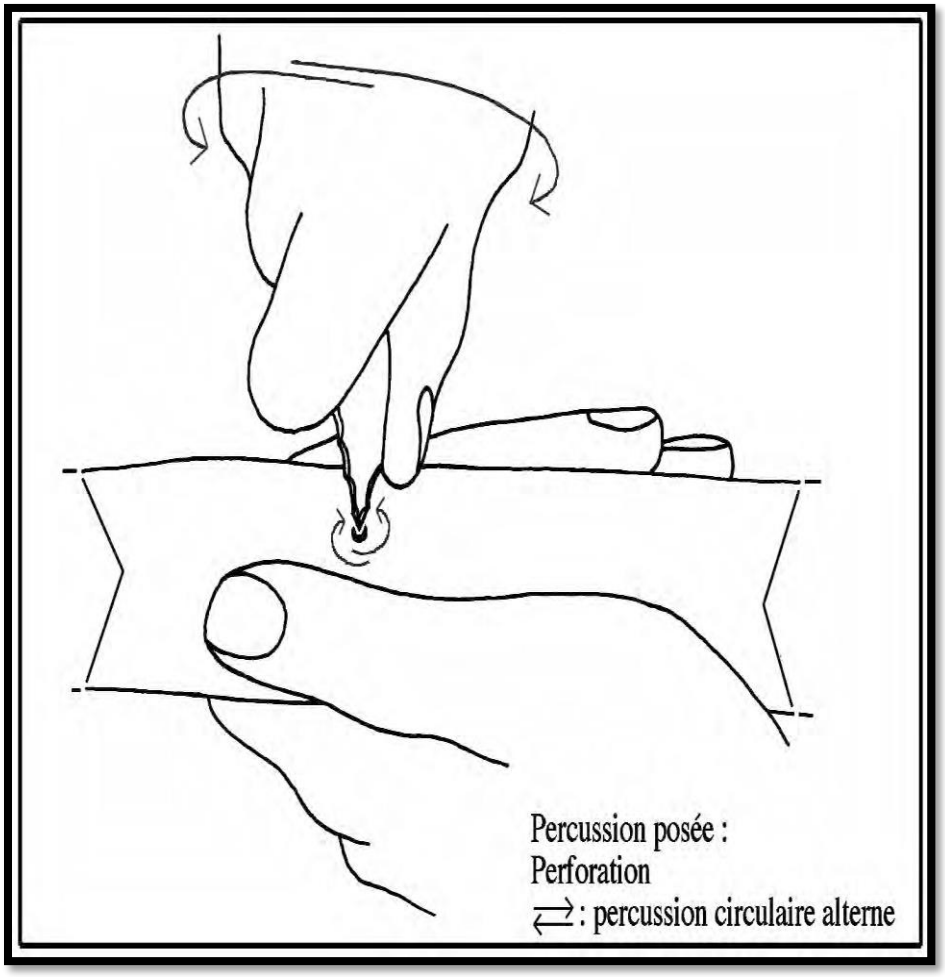
The movement of bones by large animals (such as bears in caves) causes fracturing and bone abrasion. The streaks vary in width and orientation depending on the heterogeneous grain size of the soil.

2.3. Carnivore marks:

When carnivores gnaw on bones, their tongues have a "rasp effect" that produces polished and blunt surfaces. What is more, the action of saliva, which has an acidic pH, can lead to the formation of cupules.

3. Marks of anthropogenic origin:

Perforations produced experimentally by the rotational movement of a handheld lithic drill leave fine streaks around the hole resulting from the contact between the tool and the bone (scraping). The streaks may be less regularly arranged.



- In the case of perforations made with a bow drill, the streaks are always very regularly arranged. Prolonged action can erase the streaks, resulting in a polishing effect.

3.2.Marks of non-anthropogenic origin:

- Vascular foramen: A natural hole left by the passage of blood vessels inside bones with a slightly oval profile.

- The perforation continues with branched grooves corresponding to the imprint of blood vessels.

- Carnivore action: The attack of bone by a carnivore's canine (pressure) produces a more or less circular pit, and the edges of this perforation are irregular.

- Sometimes bones are ingested and regurgitated by hyenas, and the corrosive action of gastric juices enlarges the vascular holes.

As evidenced by all these examples, confusion between marks of anthropogenic and non-anthropogenic origin is possible. Therefore, before undertaking any paleoethnographic interpretations of bone material, it is essential to conduct a thorough taphonomic analysis. Sometimes, observation with a binocular loupe is not sufficient, and the use of SEM becomes necessary.

VII- The study of bone objects

Bones are considered a raw material just like ivory, shell, reindeer antler, and deer antler. The first step is to determine the ends:

1. extremity:

1.1. Distal extremity: refers to the acting extremity (active part), hence the furthest from the hand that uses it.

1.2. Proximal extremity: to designate the extremity closest to the hand, which ensures the grip of the object (passive part).

The use of these terms is criticized because they are borrowed from anatomy, and sometimes a proximal extremity of an experimental punch corresponds to the distal (anatomical) extremity of the bone. Ch. Prost proposed the terms "apical" and "basal", while Chamla prefers use the expressions "proximal" and "distal". However, for her, it is still not easy to determine the anatomical origin of the bone used. If possible, she proposes adding the anatomical qualifier to the terms "distal" and "proximal".

Orientation:

An object made of bone is oriented by placing it longitudinally facing the observer.

- The upper face:

This is the best-polished face, corresponding to the external part of the bone.

- The lower face:

Corresponds to the internal part, the face on which the object rests often still bearing traces of either the medullary canal or the spongy tissue of the bone from which the tool was extracted.

- If polishing affects both faces to the point where they cannot be differentiated, it matters little whether one considers either as the upper face.

- In cases where they are dissimilar, yet fully polished, it is accepted that the concave or less concave, or the flatter face is considered the lower face.

Examination of the shaft:

1. The profile of the edges.

2. The cross-sectional views of the actual ends.

3. The distal, medial, and proximal parts of the shaft.

Firstly, determining where the ends stop and where the shaft begins and ends is essential.

It's impossible to establish a common absolute measurement for objects whose dimensions and morphology can vary greatly.
Therefore, who proportions are adopted :

- The distal extremities corresponds, for example, to 1/5 or 1/6 of the total length of the object.

- Sometimes, both extremitys alone form the entirety of the piece, as is the case with certain arrowheads composed of a distal and a proximal extremity without a stock. In this case, the stock is absent, so it's up to each person's judgment to determine the location of the distal and proximal sections of the stock (if it's a complete piece).

The right edge: the one located to the observer's right.

The left edge: the one located to the observer's left.

Additionally, a preferential order has been adopted in the description: the left edge is always named before the right edge, the upper face before the lower face.

Procedure for studying a collection:

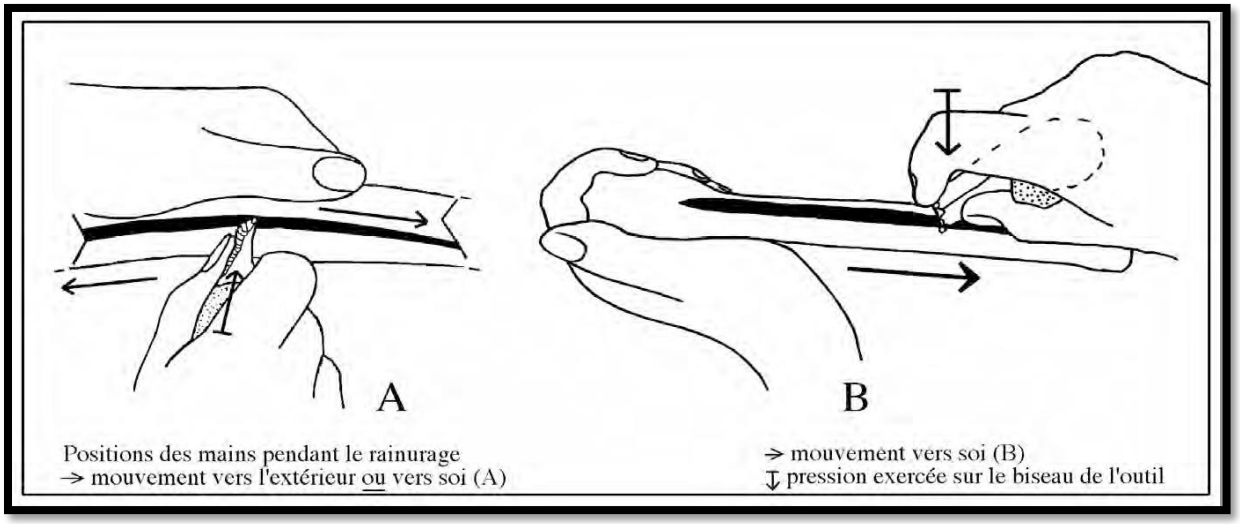
1. Know as many objects as possible, and to do this, one must resort to:
   - Typological cards
   - Previous classifications
   - Regional monographs
   - Detailed studies on specific objects (perforated sticks, spear points, spear-throwers, arrowheads, sickles, harpoons, etc.)
   - Plus, the direct examination of a large rang of objects.

   2. Consider all the morphological possibilities of each part of the initial nomenclature (combinations offered by geometry).
   - Sections (highly varied)
   - Edge profiles
   - Measurements

After completing these steps, the following activities and modifications made on the bone are studies :

1. Retouching: similar to lithic material (direct and indirect).
2. Grooves: more or less parallel or straight marks, with variable depth and length, generally.
3. Engraving: a carved line differs from a grooved line by greater depth of incisions and generally longer length, as engraving is deliberate.
4- Sawing: This involves wearing down the material in a specific area of the bone to cut it. It is achieved by the back-and-forth movement of a lithic blade pushed perpendicularly to the longitudinal axis of the support, creating a groove.

6. Grooving: This process involves digging a longitudinal groove in the bone or antler by a unidirectional back-and-forth movement using a sharp object such as flint (similar to the manufacturing of comb teeth). According to experimentation, there are other techniques for making a comb, including the individualization of teeth (sawing).



6- Stripping: Stripping involves making a series of notches (perforations that cut the material) for coarse shaping, preparing a surface (flattening, unifying, narrowing, etc.).

7- Abrasion: Abrasion occurs by rubbing the object on a stone with coarse, medium, or fine grain, resulting in a heavily striated surface.

8- Scraping: Scraping involves wearing down a bone surface using the edge or blade of a tool with the intention of reducing, smoothing, or sharpening the object.

9- Abrasion and Polishing: Polishing, like abrasion, results from the wear of an object through contact with a material. Abrasion is the wearing,grinding or rubbing away the tool by friction. Polishing occurs in the final polishing operation. With both utility and aesthetic purposes, the latter is encountered on all clothing or prestige items, such as pins, beads, etc.

While some of these modifications may alter the overall morphology, the most significant changes include:

1- Pointing: creating a point by percussion, converging the edges of the piece.

2- Sharpening: refining a point through polishing, which removes edges.

3- Notching

4- Edges

5- Perforation: there are two methods of perforation:

- By incising
- Perforation by rotary movement (which acts by wear)

The first is achieved by percussion using a percussor, placing the edge of the tool and striking the other end of the tool.

The second can be applied in various ways:

- Simple drill, involving a pointed tool that is rotated in the palm of the hand.

- Cord drill, with a hook for attaching to pass a cord or strap. Non-through perforations also allow for the creation of insertion cavities.

VIII- Terminology :

الصناعة العظمية	Industrie osseuse	Bone industry	
definition	French	Arabic	English
The process of classifying tools and categorizing them into typological lists while adhering to specific criteria.	التنميط	La typologie	typology
Groupe des Tranchants	**مجموعة القواطع**	**Group of Cutting Tools**	
Flat and elongated bone tools bearing a cutting edge (beveled edge) either at one of their extremities or along their edges	المقدات	Les tranchets	paring-knives
Flat and long bone tools bearing a straight cutting edge at one extremity.	المقدات ذات حد مشدوف مستقيم	Les tranchets à biseau droit	Paring-knife with Straight chisel-edge
Long and flat bone tools bearing a cutting edge (blunt edge) slanted at its extremity	المقدات ذات حد مشدوف مائل	Les tranchets à biseau oblique	Paring-knife with oblique chisel-edge
Long and flat bone tools bearing a cutting edge (blunt edge) concave at its end, with the blunt edge starting from one side of the end and ending with lateral spur	المقدات ذات حد مشدوف مقعر و زائدة	Les tranchets à biseau concave à ergot latéral	Paring-knife with concave chisel-edge and lateral spur
Long and flat bone tools made on a scapula or part of the pelvis, bearing a cutter on one	السكاكين ذات ظهر طبيعي و خشن	Couteaux à dos naturels épais	Knife with thick natural back

of its edges, while the second edge is natural			
Long and flat bone tools made on a rib or bone splinter, bearing a cutter on one of its edges, while the second edge is polished in the case of using a splinter.	السكاكين المسطحة	Couteaux plats	Flat knive
A flat and long bone tool with a cutting concavity on one of its edges.	الكفّة	L'estèque	Potter's scraper
A flat and polished bone tool, with one of its edges equipped with almost regular and sharp serrations.	المشط	Le peigne	Potter's comb
A long, rough, and hard bone tool, with its distal part beveled using flaking or cutting, never polished as seen in awls.	إزميل	Le ciseau	Chisel
A long bone tool, flat and polished, with a variable cross-sectional body, which always ends in a narrow and flat edge	المجرفة	La pelette	Pellette
Groupe des Mousses مجموعة الملساء The Blunted tools			
Long bone tools characterised by the absence of a cutter at the distal end, which is always polished at the distal end, which spreads to one or both edges;	السلاسل	Les lissoirs	Smoothers

Long and polished bone tools, somewhat rough, with serrated edges. They are always thicker than 5mm, and their far end is rounded and polished	السلاسل الخشنة ذات مقطع مستدير أو شبه رباعي زوايا	Les lissoirs épais à section circulaire ou sous– quadrangulaire	thick smoothers with a circular or sub-quadrangular cross-section
Long, flat, and polished bone tools, typically less than 5mm thickness and with a width of around 2cm in most cases. Their edges are parallel, and their far end is rounded in an arched shape.	السلاسل المسطحة و الطويلة ذات نهاية مستديرة	Les lissoirs plats et allongés à extrémité arrondie	Flat and elongated smoothers with rounded end
Long, flat, and polished bone tools, with a consistent thickness and width along the length of the tool. Their edges are parallel and then meet at the far end to form a dihedral angle	السلاسل المسطحة و الطويلة ذات نهاية على شكل زاوية زوجية	Les lissoirs plats et allongés à extrémité ogivale	flat, elongated smoother with ogival extremity
Long bone tools with parallel and well-polished edges, with rounded ends, slightly swollen on their upper face, always less than 10mm in width. Most of these tools bear a hole.	العصيات	Les bâtonnets	Little sticks
Rough tools of varying lengths, with a mostly regular shaft, and a distal end that is truncated, slightly swollen with serrated edges.	المصقلة	Le brunissoir	Burnisher
A polished, flat, and long bone tool, with a flat	المسوط	La spatule	Spatula

shaft, narrowing to about one-third of its length before expanding to form a rounded and serrated end, maintaining a consistent thickness along the tool.			
"A long, flat, and thin bone tool, with a concave upper surface and smoothed edges."	الملعقة	La cuiller	Spoon
A thin and light bone splinter, with a thickness not exceeding 2mm, making it fragile. Its upper surface is well-polished, its edges are smoothed, and its far end is thin	نصيلات عظمية ثلمة	Lamelles osseuses émoussées	Blunted bone blades
Groupe des perforants	**مجموعة المخارز**	**Perforating artefacts**	
Bony tools characterized by a sharp edge very thin, with a diameter always greater than 3mm and a length less than 18cm. The variation in these tools lies not in their pointed part, but in the cross-section of their stock	المثاقب	poinçons	Awls
Bony tool shaped on a bone splinter or on the bone of the tibia of some small mammals, its polishing includes only a few centimeters adjacent to the pointed end."	مثقب اقتصادي	Poinçon d'économie	Economy awl

Bony tool shaped from long and complete bones of some small mammals, its far extremity is broken and polished to form a pointed end, while the closer extremity retains its natural extremity	مثقب ذو مفصل محفوظ كليا	Poinçon avec poulie articulaire	Awl with epiphysis
A sturdy and robust perforator crafted from a longitudinally split long bone, partially preserving its joint.	مثقب على عظم مشقوف طوليا ذو مفصل محفوظ جزئيا	Poinçon pris sur os fendu longitudinalement	awl in bone taken from split lenghthwise
Sharpened tool crafted from a medium-sized bone splinter, the splinter is polished along its shaft without reaching its closer end, but the polishing is not good enough to conceal the bone marrow channel.	مثقب على شظية عظم ذو جزء أقرب غير مصقول	Poinçon pris sur esquille d'os à extrémité proximale incomplètement polie	Awl made from a splinter of long bone with incompletely polished proximal extremity
A pointed tool crafted from a medium-sized bone splinter, the splinter is polished along its shaft but the polishing is not good enough to conceal the bone marrow channel. Its closer end is flat, while its further end terminates in a long, sharp point like a tongue	مثقب سهمي	Poinçon à dard	Stiletto-tipped awl

Pointed tool crafted from a medium-sized bone splinter, the splinter is polished along its shaft but the polishing is not good enough to conceal the bone marrow channel. Its closer end is rounded. Concealing the bone marrow channel, its closer end is rounded	مثقب ذو جزء أقرب مستدير	Poinçon à extrémité proximale arrondie	Awl with rounded proximal end
A taper formed on a bone splinter of medium dimensions, polished along its trunk but the polish is not sufficient to conceal the bone marrow channel. Its nearest end is flat with a beveled edge, suitable for use as a cutter if sharp or polished if blunt.	مثقب ذو جزء أقرب رقيق	Poinçon à extrémité proximale amincie	Awl tapered proximal end
A well-polished taper on a bone splinter, concealing the marrow channel, with a rectangular, oval, or triangular cross-section. Its nearest end is polished but never flattened.	مثقب مصقول كليا ذو مقطع مستطيل أو مثلثي أو بيضاوي	Poinçon entièrement poli à section rectangulaire, triangulaire ou ovale	Completely polished awl with a stock of rectangular, oval or triangular section
Well-polished tapering to conceal the marrow channel, with a conical shaft, its circular section gradually increases from	مثقب ذو جذع مخروطي	Poinçon à fût conique	Awl with conical stock

the taper to its nearest extremity			
Tapered with a cylindrical shaft, well-polished, its section remains consistent directly below the taper to its nearest extremity	مثقب ذو جذع أسطواني	Poinçon à fût cylindrique	Awl with cylindrical stock
A well-polished taper with a convex stock that bulges at its center, with the diameter of its extremity always smaller than the diameter of its stock	مثقب ذو جذع منتفخ	Poinçon galbé	Awl with curved stock
A well-polished bone tool, with both extremites tapered but not consistent.	مثقب مزدوج	Poinçon double	Double tipped awl
A non-straight awl, which can either have a curved tip, a stock with remaining ridges where polishing couldn't remove them, or a curved stock	مثقب ذو جذع غير منتظم	Poinçon à fût non rectiligne	Awl with Non-rectilinear stock
A very light, well-polished, tapered tool with a variable cross-section and a diameter always less than 3 mm. In most cases, it is fragmented	مخرز	L’alène	Thin awls
A well-polished stem with a variable cross-section, equipped with a head or a polished bulge at its proximal end. This bulge varies from one	دبوس	L’épingle	Pins

tool to another, including: • A pin with a tapered head compared to the longitudinal axis of the tool. • A pin with a straight head relative to the longitudinal axis. • A pin with a flat and elongated head, where the proximal end is broad and flat. • A pin with a spherical head, where the end is large and prominent			
The tools that fall under the category of awls, are used for sewing and are divided into two sections.	إبرة	L'aiguille	Needles
awl with a conical, cylindrical, or oval stock, with a diameter not exceeding 8 to 5 cm, and it is equipped with hole at the nearest extremity. If its diameter exceeds 8 cm, it does not fall under the category of eyes needles.	إبرة ذات ثقب	L'aiguille à chas	eye Needle

It is fashioned on a hollow bird bone, with its furthermost part cut into a sharply pointed edge, and the nearest extremity left open. It is used as a sewing tool where the thread passes through the channel, serving the same purpose as eyes.	إبرة ذات قناة	L'aiguille à canal	Tubular needle
They come close to needles with a channel, but there is no continuity in the marrow channel where the natural end of the bone is preserved. These tools are also made on a split hollow bone, with the furthermost end being long, pointed, and polished	الريشة	La plume	Nib
Consists of well-polished double punctures with a circular section, where the two pointed ends are strictly symmetrical. Humans use it for fishing by attaching it to a thread and when the fish swallows it, the pointed ends pierce its flesh, facilitating its capture	صنارة مستقيمة	L'hameçon droit	Straight Fish-hook
Consists of a double puncture, with symmetrical or non-symmetrical pointed ends, bearing a	صنارة مستقيمة ذات حزّة	L'hameçon droit à rainure	Straight Fishhook with Groove

somewhat thin and deep groove along the length of the tool for holding the thread and bait.			
A tool made of polished bone with a round section, shaped like a hook, one end of which is more curved than the other and pointed. Known in many Neolithic sites in North Africa	صنارة مقوّسة (معقوفة)	L'hameçon courbe	Bent Fish-hook
A projectile weapon where the handle separates directly when the pointed end penetrates the animal's body. It is made of long, pointed bones, with a variable section, bearing one or both edges. (barb) thorn. In North Africa These tools vary in the form of their base -Harpoon Head With a conical or circular smooth base -The harpoon head with grooved heel -The harpoon head with perforated heel -harpoon head with swelling on the heel -harpoon head with notched heel	رأس خطاف	Tête de harpon	Harpoon head
Artefact in polished bone, of oval section, the diameter always superior	رأس رمح	Les pointes de sagaie	A sagai point

to 1cm, and with a head point. In spite of polishing the lower surface generally retains the trace of the medullary canal			
Weapon in polished bone of circular, oval or flattened section, the length is always superior to 18 cm, provided with a hard point more or less tapered	خنجر	Le poignard	Daggers
Groupe des fauciles مجموعة المناجل Group of sickles			
Artefact in bone, usually made of long bones, commonly crafted from animal ribs, bearing a broad, long, and deep groove on one side. Its main purpose is to insert stone geometric microliths within this groove.	منجل	La faucille	Sickle Hand
Objets de parure مجموعة الحلي Items for adornment			
Tubes made of bones: Humans use the long hollow bones of birds, spreading their extremity and polishing their edges, giving them a cylindrical tube shape with a length always greater than 5 cm and sometimes adorned with grooves for decoration	أنابيب من العظام	Les tubes en os	Bone tubes
Jewel made of bones with varying shapes,	قلادة	La pendeloque	**Pendant**

characterized by one or more holes used for hanging. Sometimes these elements are made oب other materials such as ivory, turtle shell, or even tusks of pigs or elephants.			
Long beads made on hollow bones, pointed at both ends and well-polished along the edges, their length not exceeding 5 cm (more than 5 cm, they become bone tubes).	اللآلئ الأسطوانية	Les perles tubulaires	Tubular bead
They consist of cutting flat and thin bone circles, then drilling them and adjusting their edges by polishing them well or obtaining them by slight transverse spreading for hollow bones, and the hole in this case is natural	حلقات عقد	Les rondelles d'enfilage	Bead
Solid bone splinters, cylindrical in shape and well-polished, where their extremities are flattened and then polished well. They are found in the desert. Tyey are made of quartz and tapered at the extremity. They have a ritual dimension, where they are directly inserted under the lower lip after	شفتورة	Lip-plug	

extracting the lower incisors. The purpose of this is to ward off diseases and evil spirits			
Identifying the substrate for an animal's bones	السند التشريحية	Le support anatomique	anatomical support
Transverse notching is a back-and-forth movement perpendicular to the longitudinal axis of the tool using a cutter	نشر	Le sciage	Sawing
Longitudinal notching, which is a back and forth movement on the longitudinal axis of the tool using a cutter	حز	Le rainurage	Grooving
This is the process of levelling the surface of an object in a one-way motion using a medium-grained pebble, most often sandstone.	حك	Abrasion	Scratch
This is the process of levelling the surface of an object with a one-way motion, in this case using a cutting tool, i.e. a scraper.	كشط	Raclage	Scraping

The method is the same as scrubbing, but in this case we use a very fine-grained sandstone.	صقل	Polissage	Polishing
It is obtained by using a cutter in a deep, face-to-face or double-sided cutting or peeling process, or by using a piercing tool in a rotating motion.	ثقب	Perforation	Punching
These are all man-made tools from organic materials, some of which date back to the Lower Paleolithic period, consisting of bones, shells, ostrich eggs, turtle shells, ivory, elk antlers (animal firewood), etc.	أدوات عظمية	Outillages osseux	Bone tools Bone tools
The third group of the Campus Fabre classification of North African bone tools, which ranges from class 18 to class 48, includes all	مجموعة الأدوات الثاقبة	Groupe des perforants	Perforator group

tools with a pointed point.			
The second group of the Campus Fabre classification of North African bone tools, which ranges from Class 10 to Class 17, is characterised by the absence of a cutter and the importance of polishing.	مجموعة الأدوات المثلمة	Groupe des mousses	The Blunted tools
The first group of the Campus Faberer classification of North African bone tools, ranging from Class 01 to Class 09, includes all tools with a cutter centred either on the end or on the rim.	مجموعة الأدوات القاطعة	Groupe des tranchants	Cutting edge group
This is the fourth group of Camps-Faberer's classification of North African bone tools, which includes a single item, 49, the sickle (see definition of sickle).	مجموعة المناجل	Groupe des Fauciles	Group of sickles

This is the fifth group of the Campus Fabre classification of North African bone artefacts, which ranges from class 50 to class 54, and is generally made of hollow bones or perforated pieces of various materials intended for decoration.	مجموعة الحلي	Groupes des parures	Group of Ornaments
In other words, humans only cut the bone for the purpose of extracting and eating the bone marrow	غرض الاستهلاك	But culinaire	Culinary purpose
The purpose here is to cut the bone to use the split fragments as tools after they have been prepared, and sometimes marrow can be used as well.	غرض استعمالي	But utilitaire	Utility purpose
It consists of an in-depth study of site genesis, and archaeological material, like the bone surface and the	الطافونومية	Taphonomie	Taphonomy

identification of all the developments and deformations that occur in the soil due to natural factors, from abandonment to discovery.			
It was first identified by the researcher Guymon Dart to identify the industry used by australopithecines before they knew the stone industry, which consists of tools made of bones, teeth and horns.	أوستيودونتوكيراتيك	Ostéodentokératique	
It consists of the process of cutting the bone by placing it on an anvil and hammering it with a hard hammer (stones)	طرق مستند باستعمال مطرق	Percussion posée avec percuteur	Percussion with firing pin
It is the process of cutting the bone by grasping it by hand and hammering it against a hard material (e.g. a rock)	الطرق بالرمي	Percussion lancée	Thrown percussion

It consists of the process of cutting the bone by placing it on an anvil and hammering it indirectly with a hard hammer (stones) by using an intermediary between the hammer and the bone (e.g. a stone tool).	طرق مستند باستعمال وسيط	Percussion posée avec intermédiaire	Placed percussion with intermediary
These are all the transformations that we find on the raw material (bones) and the main culprit is the human being	بفعل الإنسان	Anthropique	Anthropogenic
It is the solid material (rock) used by humans in the process of cutting tools	السندان	Enclume	anvil
This is the pressure we exert on the bone, for example with a cutter, by pointing it deep into the bone and removing small fragments for drilling.	التقشير	Entaillage	Notching
It is the adapted, active, vital part of the bony instrument	النهاية الأبعد	Extrémité distale	Distal extremity

This is the inactive, non-vital part of the bony instrument, also known as the muscular area, sometimes still retaining the natural end of the bone.	النهاية الأقرب	Extrémité proximale	Proximal extremity
These are man-made serrations on the edge or two edges of some bony spikes, known as a hook-headed spike.	تشوك	Barbelure	Barbs
Traces or marks left by nature or man on the surface of bones.	آثار أو علامات	Stigmate	stigma
A natural adhesive used to stabilise tools such as machetes, such as glue	غراء طبيعي	Colle naturelle	Natural glue
A face-to-face or edge-to-edge diagonal cut used especially in the incisor group.	حد مشدوف	Biseau	Beveled edge
is to make the edge very sharp	تشحيذ	Affutage	Sharpening
A hollow within the long bones to contain the marrow	قناة النخاع	Canal médullaire	Medullary canal

IV- Bibliography

- **Andrews .P .1994**, Experiment in taphonomy natural history mesium, London.
- **Aouragh .H.2009**, Histoire du peuplement paléolithique de l'Afrique du nord et dynamique des interactions entre l'homme et son environnement ; Centre universitaire de recherche archéologique ; faculté des sciences, université Mohamed 1er ; Oujda. Maroc ;pp 240-241.
- **Andrea .MF. ; 2004**. Etude taphonomique et genése du gisement pliocène supérieure (villafranchien moyen) de saint vallier (drome, France) .UMR 5125, université Claude Bernard. Lyon 1.p.324.
- **Averbouh .A .et Provenzano.N .1998-1999** ; Proposition pour une terminologie du travaille préhistoriques des matières osseuse. I les techniques. Préhistoire, anthropologie méditerranéenne .T.7- 8.p 5-25
- **Averbouh .A. 2000**. Technologie de la matière osseuse, travaille et implication paléthnologique l'exemple des chaines d'exploitation du bois de cervidés chez les magdaléniens des Pyrénées, thèse de doctorat de l'université de Paris I. préhistoire ethnologie anthropologie.

- **Brugal .J.PH.2001**, Les assemblages fauniques : paléoenvirennement, taphonomie et archéologie Tome 43. Pp 33- 52.
- **Biraben .J .N ; 1969**, Durée de la vie dans la population de columnata (épipaléolithique Oranais).population .volume 24, numéro 3.
- **Cadenat .P.1948**. La station préhistorique de columnata (commune mixte de Tiaret département d'Oran) .B.S.G.A.O. T.70. pp 3-65.
- **Cadenat .P. 1954** ; Nouvelle fouille à Columnata, compagne de 1954-1955- compte rendu sommaire B.S.G.A.O ; P.264.
- **Cadenat .1956**.Fouille de Columnata. compagne 1956-1957.- La nécropole – B.S.G.A.O.pp.50-81.
- **Cadenat .P.1961**, Vestiges humain recueillis à columnata en 1959-1961. pp 506-509.
- **Cadenat. P.1966**.Vues nouvelles sur les industries de columnata .pp189-206.
- **Camps-fabrer.H.1960** ; Parures des temps préhistoriques en Afrique du nord. LibycaT.III.pp.9-221.
- **Camps-fabrer.H**. 1966: Matière et art mobilier dans la préhistoire nord Africaine et saharienne ; in mémoire du C.R.A.P.E ; N°V, pp.16-164.

❖ **Camps -Fabrer.1972a**: Typologie de l'industrie osseuse en Afrique du nord et du Sahara. Article N°VI.congrés panafricain de préhistoire, Dakar, pp279-283.

❖ **Camps -Fabrer.1972 b**. Projet de code pour l'analyse des donnée archéologique .Aix-en-Provence, pp .69-79.

❖ **Camps –fabrer.H.burelley,l, l, l.1974**. Premier résultats concernant les méthodes d'analyse, le traitement en ordinateur des objets en os de quelques gisements du midi méditerranéen ; in travaux de l'APMO, Aix –en-province.

❖ **Camps-Fabrer-H- 1975**. Le travail de l'os ; in travaux de l'APMO, Aix-en-Provence .pp.1-4.

❖ **Camps-fabrer.H. D'Anna.A.1976**. Fabrication expérimentale d'outil a partir de métapodes de mouton et de lapin ; in travaux du CNRS, n°568 Voncluse. pp.313-316.

❖ **Camps –Fabrer.1978**. Principe de classification de l'industrie osseuse néolithique et de l'âge des métaux dans le midi méditerranéen in, travaux de l'APMO. Aix-en-Provence, pp.1-4.

❖ **Camps .G.1974**. Les industries préhistoriques de l'Afrique du nord et du Sahara. article .Paris .pp.149-153.

❖ **Camps.1969**. L'homme de Mechta el Arbi et sa civilisation : Contribution à l'étude des origines Guanches .pp.257-272

❖ **Camps, Delibrias.G.et Thanneret.J.1968**. chronologie absolue et succession des civilisations préhistorique dans le monde de

l'Afrique Libyca: anthropologie, préhistoire et ethnographie. Tome XVI. pp.16

- **Campas .E.2007**. Etude taphonomique et archéozoologique du matériel faunique de la grotte d'El Harhora2 (Tamara .Maroc). Mémoire de master 2 science et technologie .O.1995.le peuplement moderne d'Afrique septentrional et ses relations avec celui du Proche-Orient, URA.164 du GNRS. Laboratoire d'Anthropologie et de préhistoire des pays de la méditerranée occidentale. Aix-en-Provence et laboratoire d'anthropologie biologique université de la méditérannée.Marseille.pp98-102.
- **Chamla.M. 1970**. Les hommes épipaléolithiques de columnata (Algérie occidentale) étude anthropologique .mémoire du centre de recherche anthropologique et ethnographique. pp. 7-131.
- **El Hadj Raoui .1994**. L'industrie osseuse atérienne de la grotte d'El Mnasra (région de Témara, Maroc) préhistoire, anthropologie méditerranéenne .pp.91-94.
- **Fadjer .K.S.2006**. L'industrie osseuse de l'horizon Keplek Holocène de la grotte Songterus, Punung, Java est(Indonésie). Mémoire de master européen d'Erasmus mundus (quaternaire et préhistoire).
- **Goutas.2004**. fiche exploitation de la matière animale au gravettien. Industrie de l'os préhistorique, matiére et

techniques. Cahier XI, Edition société préhistorique française .pp.55-73.

- **Groupe Ethos –Pelegin.J ; Peletier. A. Sidera.I. Stordeur.D. Vincent .A. Desraparahamian.I.- 1991**. Chasse-lame os ? une étude expérimentale ; in préhistoire d'aujourd'hui, archéologie expérimentale Tome II. édition Errance, Paris. Pp.123-187.
- **Hachi.S.1987**. Industrie d'Afalou Bou Rhamel (Algérie) dans leurs relations avec l'Iberomaurusien, thése de doctorat de 3eme cycle, université de Provence ; Aix-Marseille.
- **Hachi.S. 2006**. Du comportement symbolique des derniers chasseurs Mechta –Afalou d'Afrique du nord. CNRPAH. Alger.
- **Hadjouis.DJ.** Algérie ,2millions d'années de l'histoire aux origines d'Homo Sapiens.
- **Le Dosseur.2004**.Fiche travail de l'os au Proche-Orient durant l'épipaléolithique récent(Natoufien), industrie de l'os préhistorique : matières et techniques. cahier XI. édition société préhistorique Française. pp.95-100.
- **Mathis .P.1994**. Action anthropique sur les assemblages osseux et sur les ossements du paléolithique: état de recherches. outillage peu élaboré en os et en bois de cervidés IV taphonomie bone modification (artefacts, 9) pp. 133-137.
- **Matis .P.2002**. Retouchoirs, compresseurs en os à impression éraillure, fiche de la commission de nomenclature sur

l'industrie osseuse préhistorique. cahier X, édition de la société préhistorique française ; Paris .pp.21-28.

- **Merzoug.S. 2005**. Comportement du subsistance des Iberomaurusien d'après l'analyse archéologique des mammifères des sites de Tamar Hat, Taza I.et Columnata (Algérie), thèse de doctorat .
- **Merzoug.S .S. 2008**. Etude archéozoologique des mammifères Iberomaurusien de la collection de Cadenat du site RQM4. Oujda. pp.255-264.
- **Mrel.J.1975**. Sur quelque outils en os de l'épipaléolithique nord Africaine, les formes et les techniques de fabrication, mémoire de l'industrie de préhistoire et d'archéologie des Alpes Maritimes. Tome XVIII.
- **Noceiri.M.et Al, 2008** .Découverte d'un gisement préhistorique dans la région d'Abadou (haut-atlas, Maroc).acte RQM4- Oujda pp 291-298.
- **Prel-Dessuissaux, JC. 1999**. outils préhistorique, forme, fabrication, utilisation, édition Masson ; Paris.
- **Provenzano.N, 1999.techniques** et fabrication des industries osseuse terramaricole de l'âge du bronze ; in préhistoire de l'os. recueil d'étude sur l'industrie osseuse préhistorique, Aix-en-Provence. pp.273-287.
- **Snepart.I. 1991**. Industrie osseuse et traitement thermique.

compte rendu de quelques expérimentations ; in archéologie d'aujourd'hui ' archéologie expérimentale .Tome II .pp.49-55.

- **Sidéra .I.et le Grand, 2006**. Tracéologie fonctionnelle des matières osseuses : une méthode. bulletin de la société préhistorique française. Tome 103.n°2 .pp.291-304.
- **Stordeur.D .D.1999**. Néolithisation et outillage osseux, la révolution a-t-elle eu lieu ? in préhistoire de l'os. recueil d'industrie osseuse préhistorique, publication de l'université de Aix-en- Provence .pp.261-272.
- **Tartar.E.2004**. Fiche d'exploitation des matières osseuses au paléolithique inferieur et moyen. industrie de l'os préhistorique : matière et technique. cahier XI. Edition société préhistorique Française. pp.39-46.
- **Vercoutere.C. 2004**. Utilisation de l'animal comme ressources de matières premières non alimentaire : industrie osseuse et parure. exemple de l'abri pataud (Dordogne, France). Thése de doctorat. musée national d'histoire naturelle.
- **Voruz.J.L.1980**. typologie analytique de l'industrie osseuse néolithique ; in industrie de l'os néolithique et de l'âge des métaux n°2. Pp.77-104.
- **Valensi.P. 1991**. Etudes des stries de boucherie sur les ossements de cerf élaphe. Des niveaux supérieurs de la grotte du

Lazaret (Nice, Alpes-Maritimes). L'anthropologie, Tome 95, n°4. Paris. pp.796-798.

- **عبد العزيز.ش و بن شرنين.ر،** 2004.محاولة لدراسة مجموعات صناعية عظمية للعصر الحجري الحديث لمواقع : كهف الدببة ، كهف ألروية و كهف بوزاباوين المحفوظة بمتحف سيرتا،قسنطينة.