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6.1. Raw & Worked Osseous Materials

Study of bone artifacts and use techniques from the Neolithic Jordanian site; Tell Abu Suwwan (PPNB-PN).

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This paper presents the different categories of bone tools that have been recovered during the archaeozoological analysis of the faunal assemblages of Tell AbuSuwwan, a Pre-Pottery Neolithic B site, located in Jarash Northern Jordan.
This preliminary study aims to suggest the reconstruction of the manufacturing technology and the use of hard animals tissues implements. For this reason the variable characteristic related to the typology and size of the archaeological bone tools and osseous raw materials have been established. Then a comparative study on the bone tools utilisation during the Neolithic period has been considered. (FIG. 1 & TABLE.1)

Finally, an experimental approach to reconstruct the manufacturing sequence of the osseous implements has been proposed, following all the manufacturing steps from osseous raw material preparation to technology used for processing and investigating if these instruments had been utilized (FIG.2). Stereomicroscope and SEM* analyses have been carried out both on archaeological and experimental bone implements in order to discriminate the marks related to the manufacturing and utilization of the tools.

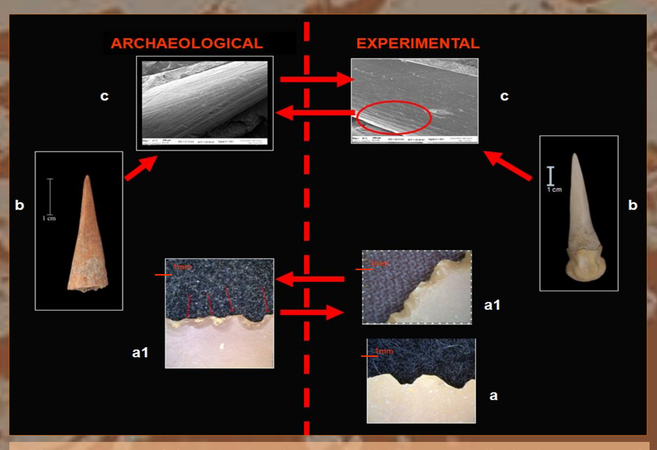

FIG. 2. Results of the comparative analysis between Tell AbuSuwwan and experimental workshop:
a: sickle blade edge before use;
a1: sickle blade edge showing traces related to bone manufacturing;
b: bone awl. On the left proximal end of an awl (ASW.10). On the right experimental awl.
c: processing-related traces left by the use of a sickle blade on the awl surface.

Osseous manufacturing technology

Analysing the archaeological bone raw materials and implements, different stages of manufacturing have been identified. In particular two main technological categories of bone tools have been recognised:
1) implements which can be prepared by bone intentional breakage fragments. In this category the suitable fractures of a bone fragment can be modified to prepare needles by abrading or using retouched stone tools. (FIG.3)
2) implements which are planned according to osseous implement manufacturing. In this category the initial phases of the *chaîne opératoire* have been followed for the preparation of all the osseous tools, while different techniques have been utilized to finish the implement. In fact either abrading traces or retouched blade scraping have been applied to sharp the pointed tools. (FIG.10)

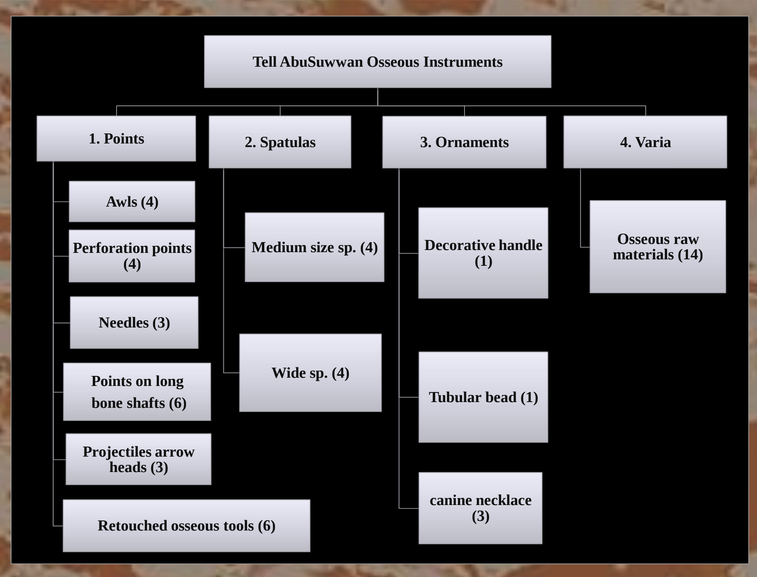

FIG. 1. Typological scheme of Tell AbuSuwwan osseous manufacts. (n) represents the number of remains for each category.

Bone tools categories	Typology		Osseous raw materials	Retouched blade (1) & Sickle blade (2)	Abrading	Utilization traces remarks	Measurements* (MM) Length/Width/ Thickness	Preservation of the points
Pointed tools	Awls (4)		Femur+Tibia	1+2	YES	YES	100.0 /20.0/5.0m	1 Tool
	Perforation points (4)		Medium size Metapodial	1+2	YES	YES	50.0/11.0/ 2.0	1 Tool
	Needles (3)		Long bone fragment	2	YES	YES	41.6/ 15.0-2 .0/ 3.0-2 .0	1 Tool
	Projectiles (3)		Medium size Metapodial Long bone	1+2	YES	NO	35.3-46.4/ 6.4-2.2/2	1 Tool
	Points on long bone shafts (6)		Medium size Metapodial	1+2	YES	YES	40.0/8.0/5.0	1 Tool
	Retouched osseous tools	Horn (2)	Sheep/Goat	-	YES	YES	92.0/38.0/10.0	1 Tool
		Long bone (4)	Medium size Long bone	1+2	YES	YES	54.0/14.0/5.0	2 Tools
Spatula	Medium size spatula (4)		Medium size Rib	1+2	NO	YES	61.0/14.0/2.3	2 Tools
	Wide spatula (4)		Rib (Aurochs)	1+2	YES	YES	136.0/24.2/8.4	1 Tool

TABLE.1. Data on the best preserved bone pointed tools and spatulas.
* Measurements of the best preserved implements for each category

FIG. 5. ASW 37
A: Distal fragment of a goat.tibia with grooving marks.
B: Detail of the grooving that splits the bone. (Stereomicroscope image).

FIG. 6. ASW 40
A: Raw osseous fragment on a Metapodial.
B:Longitudinal and transversal grooving marks that cut the bone.

The first phase is to prepare the bone surface, initially by smoothing the raw materials surface with different stone tools. This phase could be done before or after the cutting of the bone epiphysial ends in order to prepare the shaft for the further processing. The preparation phase is composed by a longitudinal intensive grooving on the raw osseous surfaces. Then the bone distal portion is separated commonly by cutting in order to produce pointed implements for perforation. (FIG. 2.b)
Another preparation category is characterized by one or more longitudinal grooving. In this way the best exploitation of the raw material was obtained; therefore more than one implement could be produced from the same bone fragment. A spiral cutting on the raw materials shaft has been observed, which could be used to prepare the proximal portion of awls point.(Fig. 4)
The disarticulation of the epiphyseal portions could be done with two methods: the first one, applying a perpendicular hafting with an hammer stone (testified by the presence of irregular fractures on the surfaces); the second one producing a longitudinal fracture by using indirect percussion with a sharp blade. (FIG.10.B)

FIG.3 .
A: ASW 1 Arrow head.
B: grooving in the distal portion to connet to the arrow shaft.

FIG. 4. ASW 36. Awl on a right femur of wild boar.

Conclusion

Through the archaeological evidences and the experimental approach, the use of lower limb bones like tibia and metapodial of wild boar, goat, sheep and gazelle has been noticed to be preferred for the manufacturing pointed implements and medium and big size animals ribs for spatulas. In general the surface of the osseous tools was prepared with a retouched lithic tool or with a scraper, while abrading techniques were utilised to finish the points. The variety of the implements, recovered in Tell Abu Suwwan assemblages, seems to reflect the specific demand of tools necessary for the various activities. Further analyses will be carried out in order to investigate these preliminary results, in particular use wear analyses will be undertaken.

FIG. 7. ASW.55: Decorative handle

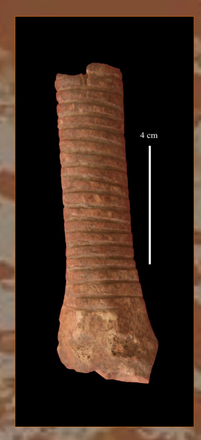

FIG. 8. ASW 29.
A: canine necklace
B: traces of thin cord. Stereomicroscopy

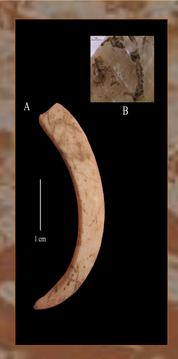

FIG. 9. ASW 16:
A: Proximal portion of a wide spatula. Ventral view.
B. Use wear traces on the proximal end (SEM Image).
C: Manufacturing marks on the ventral side. (Stereomicroscope image).
D: Manufacturing marks on the lateral side. (Stereomicroscope image).

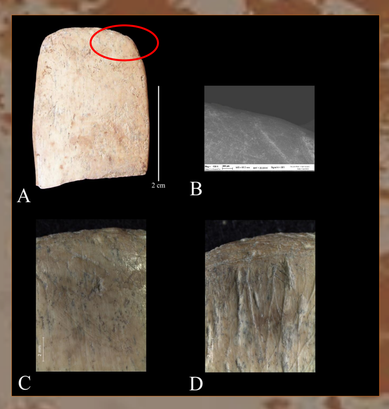

FIG. 10-A: Smoothing of raw material surfaces with different stone tools.

FIG. 10-B: Longitudinal cutting by using indirect percussion with a sharp blade.

FIG. 10-C : Use of abrading techniques to finish the points.

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