Reviewed Article:

Vegetable Plaiting Materials from the Site of Abu Tbeirah (Southern Iraq, Third Millennium BC): Experimental Approach

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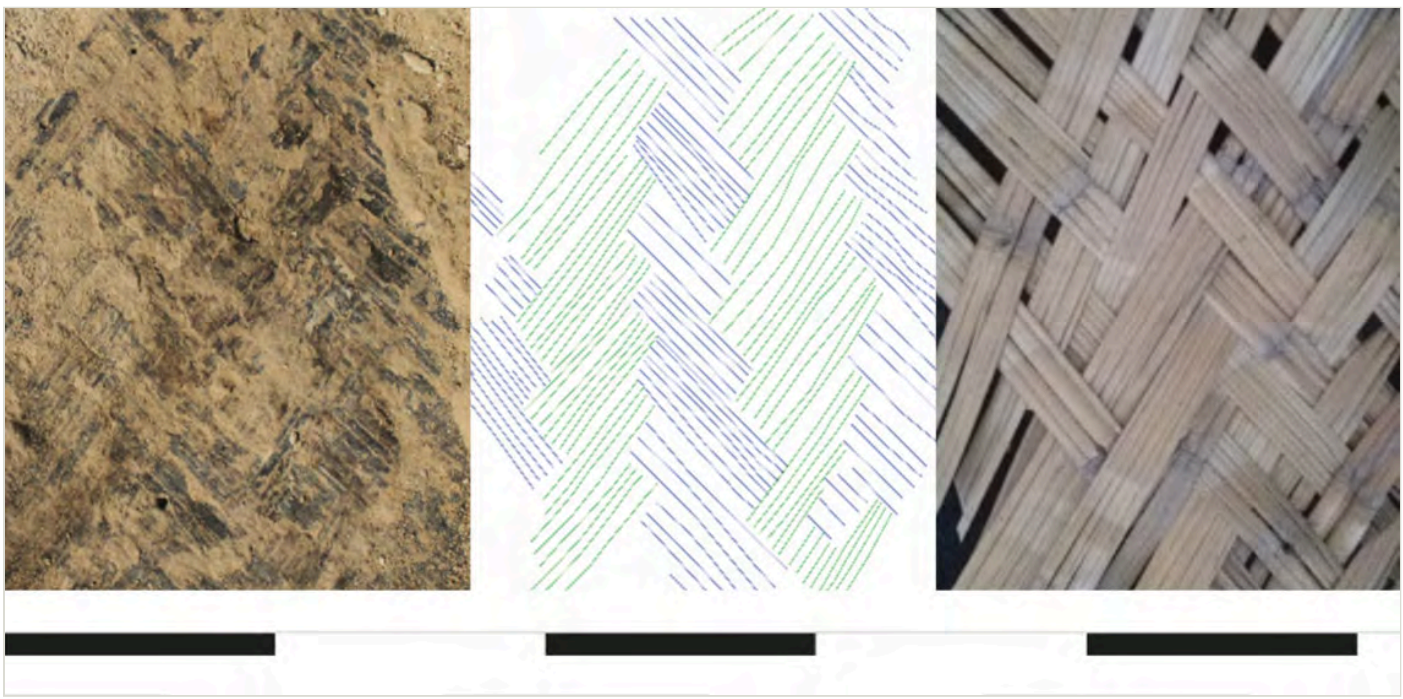

This study is based on plaiting materials from Abu Tbeirah, Iraq, with a particular attention to baskets and reed mats. The study focuses on the various raw materials used, on diverse plating techniques and tries to understand possible uses of these artefacts in their context.

The research has been developed with an experimental approach, based on archaeological and ethnographic sources.

> The original hypothesis based on archaeological remains analysis was enriched thanks to written, technical, traditional, ethnographic, and archaeological sources, leading to a more complete interpretation. That was later verified thanks to the experimental procedure, using experimental methodology allowed to cross material, ethnographical and archaeological data with ancient literature, giving a stronger base for the hypothesis and conclusions.

Context

The site of Abu Tbeirah, located near Nasiriyah in southern Iraq, is a mound dated to the third millennium BC. The ongoing Iraqi-Italian archaeological mission is led by La Sapienza University of Rome, headed by Dr Licia Romano and Dr Franco D'Agostino. The first excavation campaign was carried out in 2012 (D'Agostino *et al.* 2011, 17-34).

The site consists of a round-shaped mound of 42 hectare, *circa* 4 m higher than its surroundings and crossed from NW to SE by an ancient canal (see Figure 1). The site's history, on the basis of artefactual findings and 14C dating, goes at least from the beginning of the Early Dynastic (2900 BC) to the Ur III period (2100-2000 BC circa) (D'Agostino *et al.* 2016).

Six areas have been excavated to date. Area 1, in the southeast region, held a big mudbrick building later named Building A, covering 600 square meters and showing at least two occupation phases. Area 2, originally explored due to exposition of a rich burial, later showed traces of houses (Building B and Building C). Area 3 is a stratigraphic trench. Area 4, is located in the northeast part of the Tell and incorporates another building of the second half of the third millennium BC. Area 5 has been identified as Abu Tbeirah's harbour. Ur III contexts have been recently found in Area 6 in the northeast part of the Tell.

The environment of Abu Tbeirah was similar to the current situation of Southern Iraqi marshes: a swamp with small islands, channels and typical vegetation like reeds and rushes, common in the Euphrates and Tigris Delta. It was in the marshes that the Mesopotamian civilisation flourished and the ancient inhabitants of Abu Tbeirah exploited what the surrounding swamp had to offer, including reeds and rushes used for plaiting.

While Abu Tbeirah is now surrounded by desert, the marsh-type environment has shifted toward the south-east as an effect of multiple factors, mainly the delta progradation and the shifting of the Euphrates' course. A small percentage is still preserved: from 1970 to 2011, the Marshes extension was reduced to 6%, due to dams and indiscriminate drainages (UNEP 2011). The marshy region, located in the southernmost part of Iraq, is inhabited by Ma'dan, known as the "Marshes Arabs". Their source of subsistence is mainly agro-pastoral

(Ochsenschlager 2004), the natural environment they live in is similar to the natural context which Abu Tbeirah was located in: therefore, we based our study on Marshes' flora to deduce Abu Tbeirah's natural surroundings.

The setting was that of a brackish swamp, constituted by reeds and rushes, mainly Arundo donax known as giant reed and used in different products such as mats, houses, musical instruments, paper, sticks and fuel. Other wild plant species were *Juncus effusus* (common rush), *Typha angustifolia* (narrow-leaved cattail), *Phragmites communis* (common reed) used in mat and brush production, *Scirpus brachyceras* (club-rush) used in mat and basket production, *Phoenix dactilyfera* (date palm) whose fruit is used for wine and liquor production as well as timber for construction and other purposes (Reichinger 1964; Thesiger 2007; Ochsenschlager 2004).

In the Abu Tbeirah archaeological record there are *Arundo donax* and *Phoenix dactilyfera* remains, confirming the presence of at least two of the now existing flora component of Southern Iraq in Abu Tbeirah's environment too.

Materials

Among findings, various vegetable plaiting materials were discovered. These consisted of woven baskets and reed mats, discovered within graves and the rooms of Building A and Building B.

A botanical study was carried out by Dr A. Celant about the remains, from which we developed an experimental archaeology study. The study focused on selected materials: we based the choice on preservation, quality and varieties. We selected at least one of each type of material for the experimentation procedure. Selected materials consisted of:

- Two baskets from Room 4 of Building A (Basket A and Basket B from US 61). Basket A is square-like shaped with 30-35 cm sides; Basket B is round-shaped with a 25-cm diameter and is crossed by what looks like a handle. The two were placed on both sides of the door joining Room 4 and 3 (See Figure 2). A botanical determination was made, identifying it as *Arundo donax* remains.
- Two little baskets, found within two different graves, which we will call Basket 368 and Basket 144 (based on US numbers). Basket 368 (See Figure 3) is a small round basket with an average diameter of 10 cm. Basket 144 (See Figure 4) is a small round basket with a diameter of 10 cm, on the north side a shell was present. Due to poor preservation, it was not possible to carry out a botanical study.
- Two reed mats, one from a burial context and the second from the floor of Building A. The former will be called Mat 575, consisting of a mat placed on the bottom of a grave (See Figure 5). We will call the latter Mat 70, consisting in a thick mat covering the floor of Room 1 of Building A in its second occupation phase (See Figure 6). Given the presence of

a post-hole and remains of a hearth, we can compare it with an ethnographic context: *mudhifs*, big traditional reed buildings. In both cases a botanical determination was made, identifying it as *Arundo donax* remains.

All these vegetable remains were preserved by mummification. The aim of this experimental study was to suggest which raw materials had been used (when unknown) and for which of the different weaving techniques, and to understand possible uses of these artefacts in their context.

Experimental methodology

With the aim to understand possible weaving techniques involved in the manufacture of these materials, we analysed the work of American archaeologist James Adovasio (2010). Basing his study on more than 100,000 archaeological and ethnographic materials, he determined three main categories in plaiting techniques, depending on the elements involved in plaiting, whether they are active or passive:

1. Twining: horizontal elements (weft) are active and are twined between vertical fixed elements (warp). Weft is often double or triple.
2. Coiling: horizontal element is called “base” and is passive, vertical is called “stitch” and is the active element. Base is basically a flexible element which is organized in spiral and woven with another soft element using different stitches.
3. Plaiting: both elements are active, they are called strips and usually are intertwined with single interval (simple plaiting) or with two or more elements at staggered intervals (twill plaiting).

Each of these three categories can be further classified into sub-categories, following various features.

A digital drawing was made of each archaeological plaited material selected for the study, trying to formulate a hypothesis on the possible different procedures used by ancient Abu Tbeirah weavers and to individuate the structure of baskets and mats using Adovasio categories (See Figure 7).

Thanks to high resolution photos of each material we were also able to hypothesize which material was used in Basket 368 and in Basket 144, analysing width and structure of both warp and weft. Baskets A and B and the two mats were already botanically determined as *Arundo donax*.

Aiming to obtain a more complete view on ancient plaiting techniques, we analysed ethnographic and archaeological sources.

Ethnographic information was provided by studies carried out about Ma'dan people (Dauphin 1960, 34-49; Ochsenschlager 2004; Thesiger 2007). They still weave vegetable materials, producing plaited baskets and mats and coiled baskets and trays. For plaiting *Arundo donax* is used, which is split in half and beaten to make it softer (See Figure 8). For coiling, raw materials are different types of rushes such as Juncus, straw and others; these are used for both base and stitches.

The importance of the vegetable sources is confirmed by several pieces of archaeological evidence as well: the well-known Ubaid temple frieze shows a milking scene, in the middle there are cowsheds probably made of reeds (Gouin 1993, 136); several Early Dynastic seals impressions show structures similar to actual *mudhif* (Gouin 1993, 138), traditional reed buildings nowadays used by Ma'dan to congregate (Thesiger 1954, 287); the perforated plaque of Ur-Nanshe (dating back to Early Dynastic III period) shows the king carrying on his head what seems to be a basket (Ascalone 2005, 100-101). These are only three cases which testify to the use and importance of reed in Sumerian and Akkadian world, and the presence of basketry already from Ubaid period and during Early Dynastic (but several are later examples, such as the Rim-Sin I figurine (Ascalone 2005, 103) dated between 19th and 18th century BC and Assurbanipal stele (Ascalone 2005, 104), dated to seventh century BC, showing the king carrying a basket).

Written sources confirm the importance of vegetable raw materials: "*The debate between Tree and Reed*" was part of the main corpus of Sumerian texts studied in *Edubba* [house of tablets], the scribal school (Clifford 1994, 25-26). In Sumerian the word "reed" is expressed with "gi", a determinative with wide use such as in gi-gur (vessel), gi-lam (basket), gi-sig (fence), gi-du3 (fence), gi-kid (reed mat); there is also a specific word for basket weaver, ad-kid (ePSD online).

These archaeological and written references are only a part of the evidence that exists. However, it is more than enough to make clear the widespread use of vegetable sources in Sumerian and Akkadian everyday life.

Crossing archaeological, ethnographic and digital data, we formulated a hypothesis for each archaeological material selected, summarized in Table 1.

Location	Name	Description	Material	Plaiting technique
Room 4, US 161	Basket A	Square basket, 30 cm diameter	*Arundo donax*	Simple plaiting
Room 4, US 161	Basket B	Round basket, handle traces, 25 cm diameter	*Arundo donax*	Simple plaiting
Grave 23, US 368	Basket 368	Round basket, 10 cm diameter	*Juncus or Typha*	Twining, with almost 20 wefts

Grave 12, US 144	Basket 144	Round basket, 10 cm diameter	*Juncus or Typha*	Twining, with almost 20 wefts
Room 1, US 70	Mat 70	Floor mat	*Arundo donax*	Twill plaiting
Grave 101, US 575	Mat 575	Grave bottom mat	*Arundo donax*	Twill plaiting

TABLE 1. CROSSING ARCHAEOLOGICAL, ETHNOGRAPHIC AND DIGITAL DATA, WITH HYPOTHESIS FOR EACH ARCHAEOLOGICAL MATERIAL SELECTED.

Experimentation procedure

The next steps consisted of the creation of a reproduction starting from the hypothesis; and collecting data about the procedure and results obtained. Comparing archaeological remains with experimental reproduction allowed us to verify, disprove or improve the original idea. The experimental procedure is summarized in Figure 9.
The interpretation and experimentation was possible thanks to the help of experienced basket maker Giovanni Morra and was carried out with him in Parco Naturale dei Monti Aurunci of Latina and in Rome, in the Laboratory of Technological Analyses of Prehistoric Artefacts (LTFAPA), under Professor Cristina Lemorini's supervision.
Data was collected using documentation where we recorded general information, object, structure, vegetal used (species, harvesting period, thickness, treatment, ...), shape, description, tool used, general observation. The form used for data collection is showed in Figure 10.

The whole experimental procedure was carried out between the end of June and July. According to ethnographic sources, the right time to harvest *Arundo donax* for basketry is between October and December, when the reeds are green, soft, tall, and thick (Ochsenschlager 2004). We were not able to postpone the harvesting but we selected the tallest and thickest reeds to work with fibres as similar as possible to the one nowadays used by Ma'dan people.

Basket A and Basket B

As seen before, Basket A and Basket B were found on the sides of the door joining room 4 and 3 of Building A. They were botanically recognized as produced of *Arundo donax*, commonly known as reed. The two baskets had different shapes, Basket A being more squared than Basket B.

The technical drawing showed that both baskets were plaited using simple plaiting technique. We used wet and pressed reed, cut lengthwise.

We started with Basket A and created a square base with a simple plaiting technique.

We then proceeded to try to reproduce the round Basket B, using simple plaiting. We tried to tie a reed ring using thin reed fibres as sewing material on the plaited base to obtain a round-shaped basket, but the material repeatedly broke. Even if reed was prepared in order to make it more flexible, it remained rigid and hard to work with. We noticed that this kind of vegetable material was not suitable for this kind of work, also considering that it was harvested before the time it is usually harvested by Ma'dan and it was probably even softer.

If the structure of Basket B was that of a plaited base with a ring tied on it, the ring had to be tied with a material softer than *Arundo*, like *Typha*. In Figure 11 Basket B's construction is shown, from *Arundo donax* harvesting to plaiting.

Thanks to observation on the reproduction we were able to make some conclusions about the structure and use of these baskets.

Basket A was probably a squared little tray or basket, while Basket B had a round base with a ring tied on it with some sort of softer material.

Simple plaiting is not the easiest way to obtain a round basket: a squared base is in fact always obtained, making it near impossible to obtain the round base. The use of simple plaiting technique was then a specific choice, as well as the placing of baskets on the sides of the door: they probably had a decorative role or were used as a base for something that has not survived within the archaeological record.

Basket 368 and Basket 144

These two 10 cm diameter baskets were hypothesized to be made using the twining technique with almost 20 warps and a thin vegetable material such as *Juncus* or *Typha. Juncus* fibres are thin straws with a 0.2-0.3 cm diameter and Typha is very soft and can be split in thinner fibres. This hypothesis was mainly based on technical drawing and careful measurement of photos of the archaeological remains.

Therefore, we proceeded to make two small baskets using the twining technique both with *Typha* and *Juncus*. To confirm the twined *structure hypothesis and have a complete view, we also made a plaited basket using Typha*.

Before plaiting, *Typha* was soaked in water to make it softer and *Juncus* was boiled and soaked in water overnight, making it slightly thicker and more flexible.
The result was in the first case a very light 12 cm diameter basket with a close warp. In the second case the structure was more rigid, heavier, and less tight. The third (plaited structure with *Typha*) was a soft and tight basket but the shape was clearly different from that of the archaeological remains.

Comparing the archaeological remains' photos and the experimental copies we were able to clarify our hypothesis. It is unlikely that some technique other than twining was used in these two small baskets production; the comparison between the copy made with plaiting and the archaeological remains showed a clear difference between the archaeological remains and the reproduction structure. The vegetable fibre used was very thin and made the basket surface look rugged: we had the same impression looking at the *Typha* reproduction made using twining technique. We excluded the *Juncus* since the overall effect looked very different: warp and weft were both too thick and loose. We thought then that the structure was likely made using twining technique with very close wefts, the vegetable used was possibly *Typha* or something similar, a very soft and thin fibre making possible to obtain a rugged and tight basket. Figure 12, 13, and 14 show the making of the experimental reproductions. Differences and similarities between archaeological remains and reproductions can be seen comparing it with Figures 3 and 4.

Regarding a possible use interpretation, Basket 144 was placed by the side of the man that was buried in Grave 12, near his hands: we can think of it as a part of the grave goods which were buried together with the body. The presence of a shell can lead us to think that maybe it held some cosmetic substance, and chemical analyses are currently being carried out to discover the composition of traces found within the shell.

Mat 70 and Mat 575

Botanical studies showed that both Mat 70 and Mat 575 were made of *Arundo donax*, our technique hypothesis was that of twill plaiting. In the technical drawing we noticed a fishbone pattern in the archaeological remains. We proceeded to make it with *Arundo donax* cut lengthwise and beaten and the result was very clear: the technical drawing and the reproduction looked exactly the same (See Figure 15). We also had a small piece of mat made by Ma'dan that was brought from Iraq: comparing archaeological, ethnographic, and experimental evidence, we were able to state that the techniques and materials involved in mat production used in Southern Iraq in third millennium BC and today are the same.

Conclusions

It was possible to suggest the actual structure of these archaeological remains thanks to the experimentation carried out in this research. This project was about gaining an understanding and context of the historic period. The experimental approach gives a privileged point of view: one can handle materials and face problems and questions as third millennium BC weavers did.

The original hypothesis based on archaeological remains analysis was enriched thanks to written, technical, traditional, ethnographic, and archaeological sources, leading to a more complete interpretation. That was later verified thanks to the experimental procedure, using

experimental methodology allowed to cross material, ethnographical and archaeological data with ancient literature, giving a stronger base for the hypothesis and conclusions.

There are many study perspectives, and this methodology can be used to understand other aspects of life and customs of Iraqi people of third millennium BC.

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Keywords basketry
ancient technology
ethnoarchaeology
fibre

Country Iraq

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Gallery Image

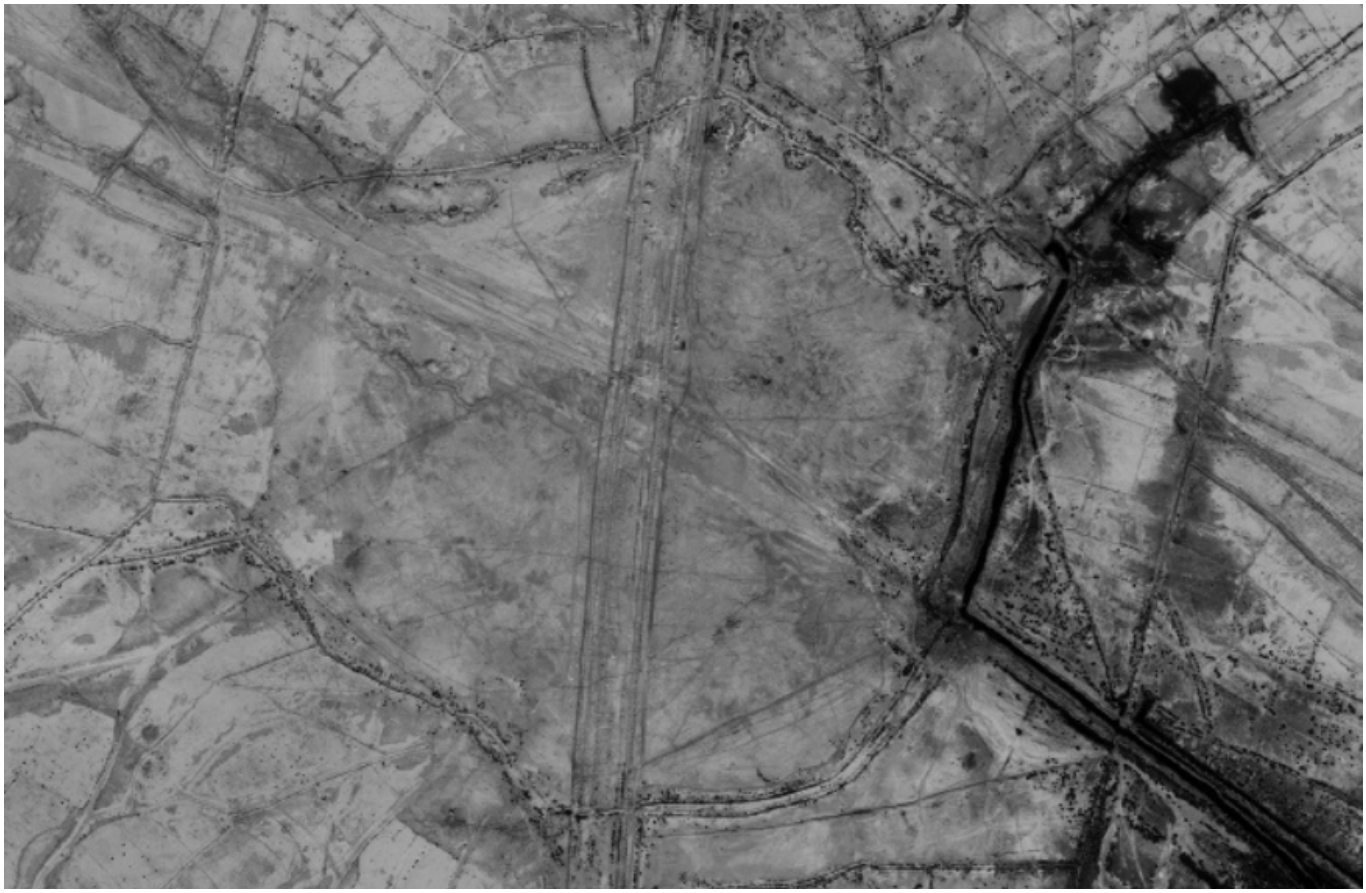

FIG 1. ABU TBEIRAH, ANCIENT CANAL REMAINS CAN BE SEEN CROSSING THE MOUND FROM NW TO SE.
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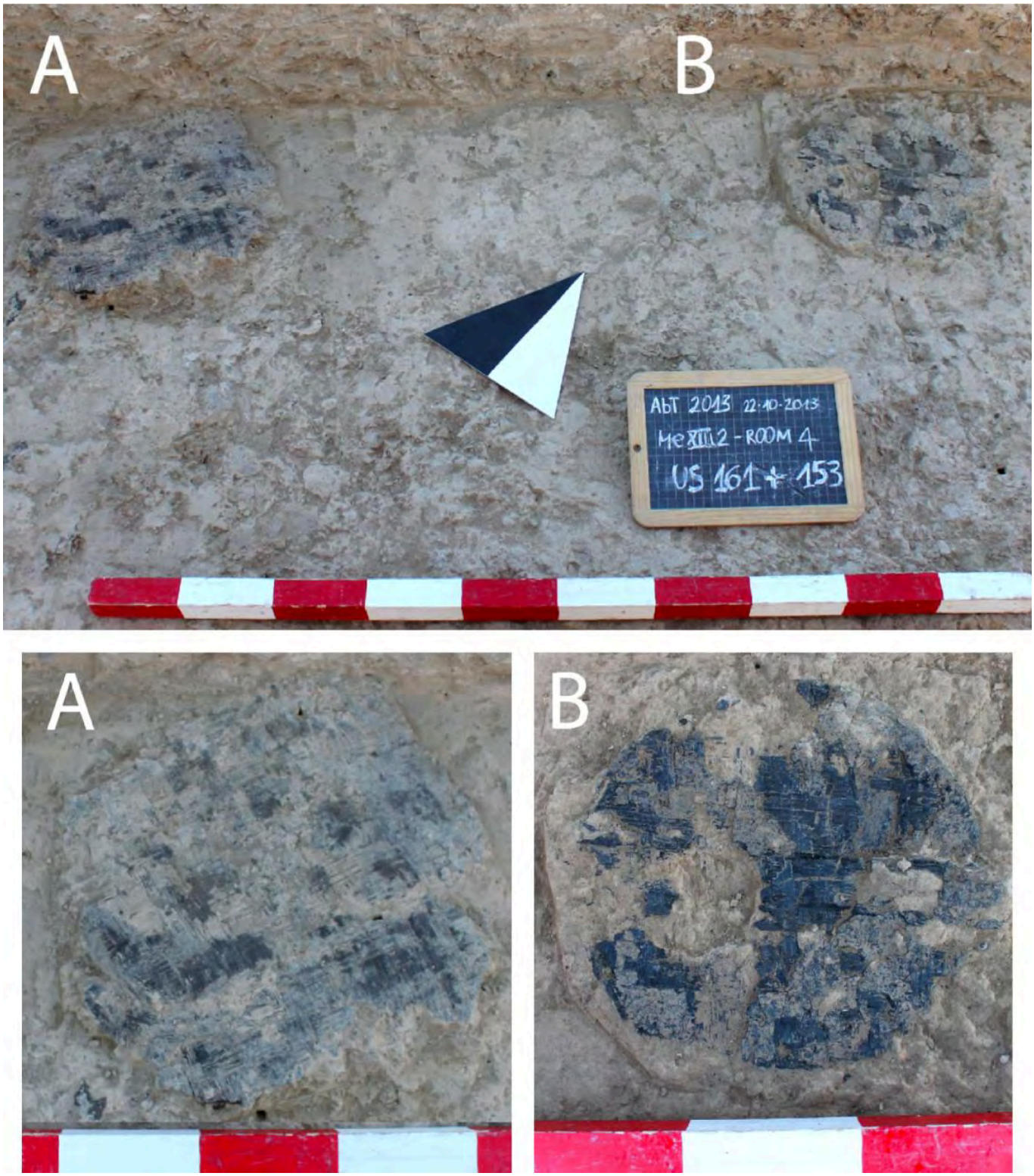

FIG 2. BASKET B AND BASKET A IN THEIR ORIGINAL CONTEXT. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 3. BASKET 368 IN ORIGINAL GRAVE CONTEXT. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 4. BASKET 144 IN ORIGINAL GRAVE CONTEXT. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 5. MAT 575 IN ORIGINAL CONTEXT, THE MAT CAN BE SEEN UNDER THE BODY AND GRAVE GOODS. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

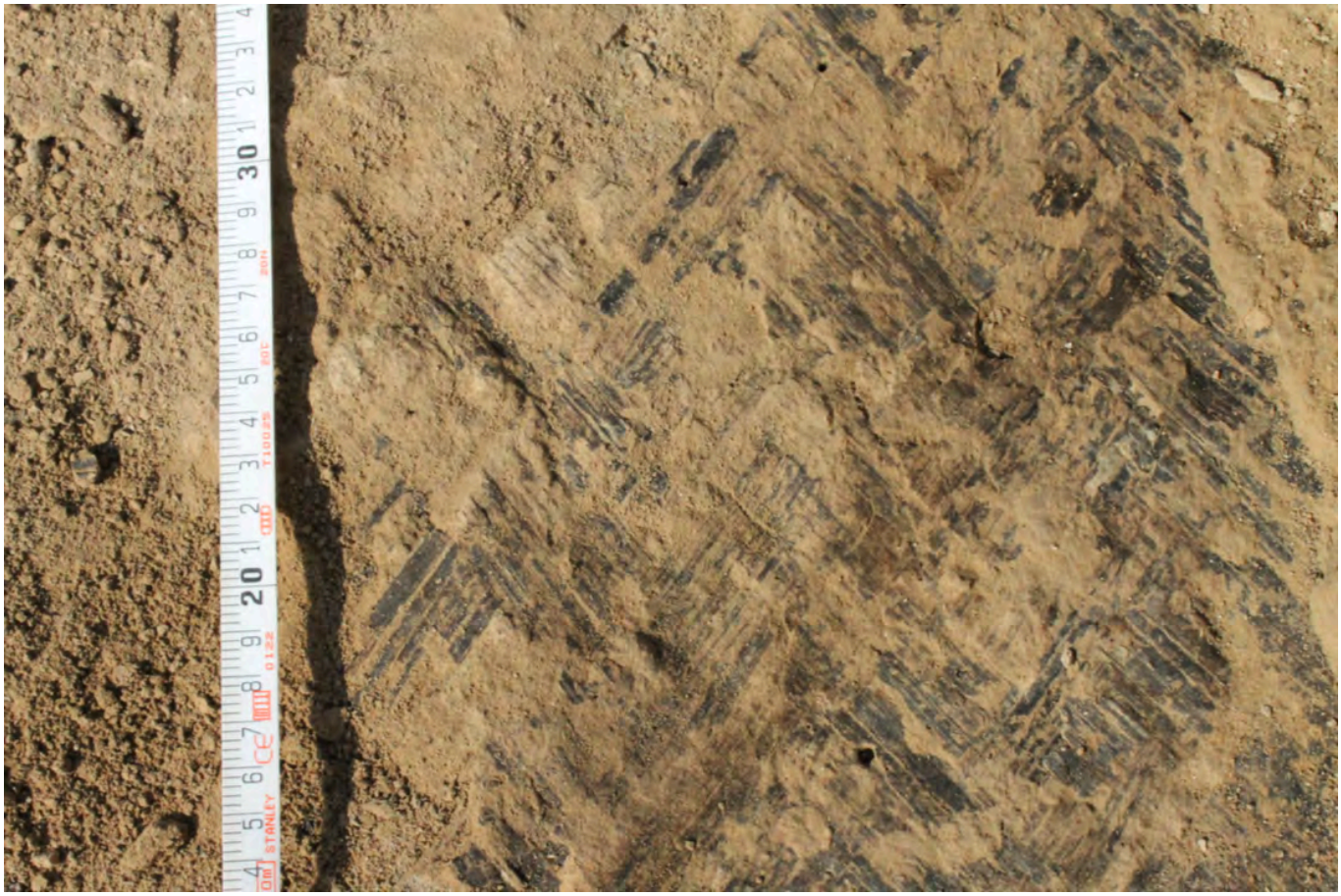

FIG 6. PART OF MAT 70 IN CONTEXT. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

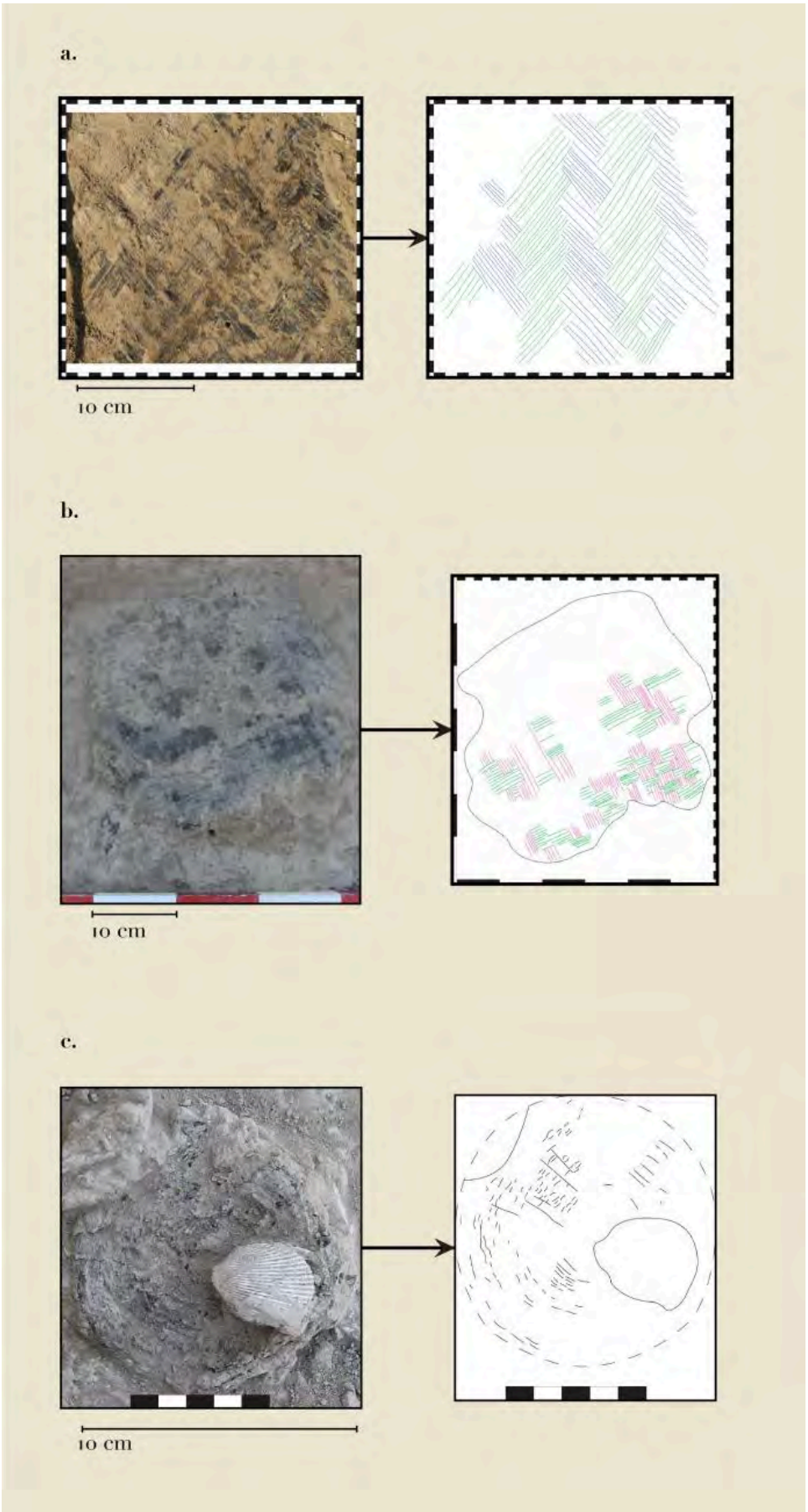

FIG 7. PHOTOS AND DIGITAL DRAWINGS. A SHOWS MAT 70, B SHOWS BASKET A AND C SHOWS BASKET 144. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 8. MAD'AN WOMEN PLAITING A REED MAT. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

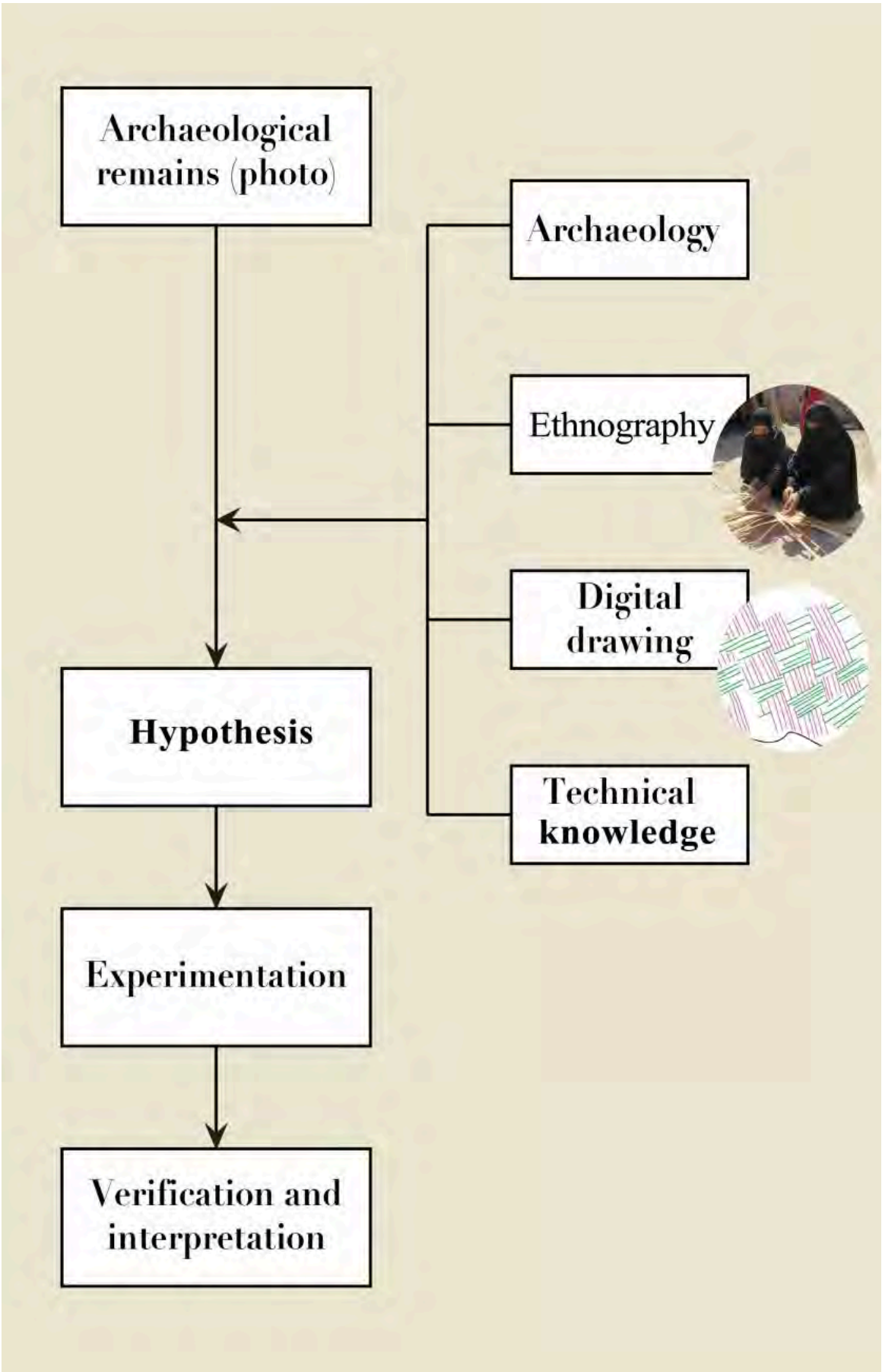

FIG 9. SCHEME REPRESENTING EXPERIMENTAL METHODOLOGY FOLLOWED. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

Experiment number	
Date	
Object	
Structure	
Description	
Vegetable fibre used	
Harvesting period	
Fibre size	
Preparation	
General observation	

FIG 10. FORM WITH PARAMETER COLLECTED FOR EACH EXPERIMENT.

FIG 11. MAKING OF BASKET A AND B, DIFFERENT STEPS FROM HARVESTING TO PLAITING. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 12. MAKING OF BASKET 144 AND 368 REPRODUCTION WITH JUNCUS AND TWINING TECHNIQUE. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

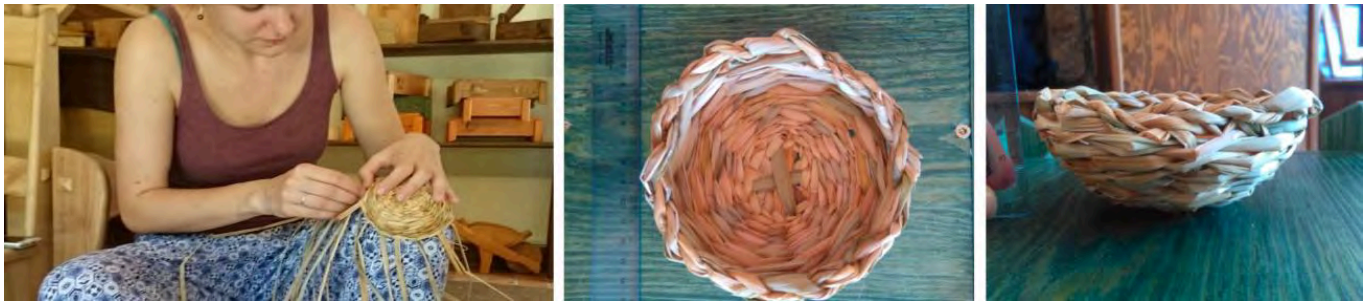

FIG 13. MAKING OF BASKET 144 AND 368 REPRODUCTION WITH TYPHA AND TWINING TECHNIQUE. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 14. MAKING OF BASKET 144 AND 368 REPRODUCTION WITH TYPHA AND PLAITING TECHNIQUE. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ

FIG 15. COMPARISON BETWEEN MAT 70, TECHNICAL DRAWING AND MA'DAN ACTUAL MAT. COPYRIGHTS: IRAQI-ITALIAN ARCHAEOLOGICAL MISSION IN IRAQ