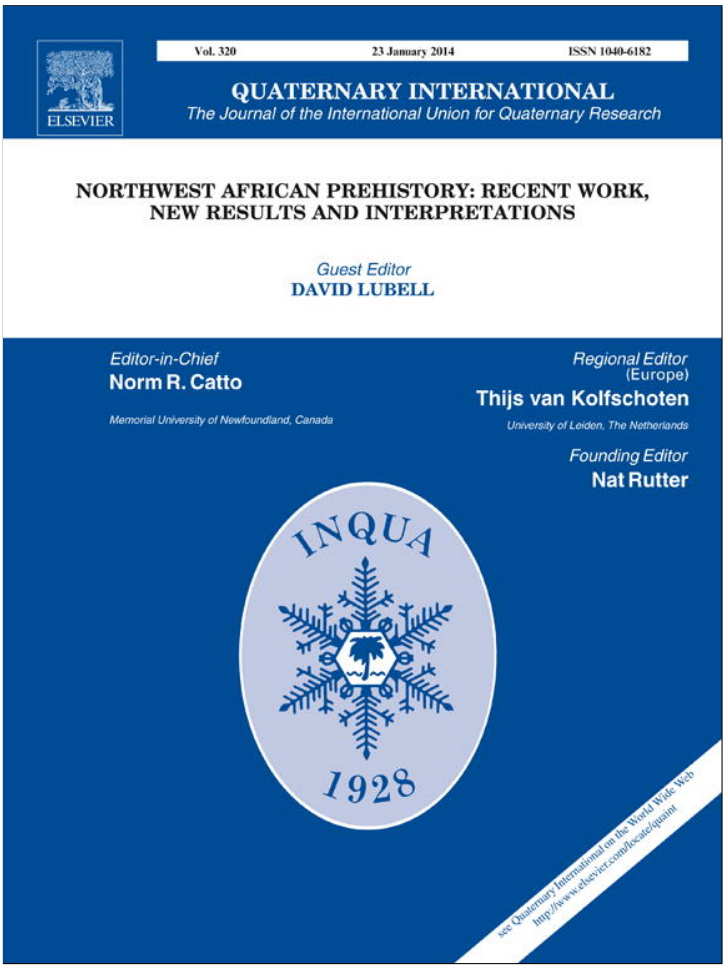

There are errors in Table 2 which will be corrected in a new paper to be entitled "Dating and Redating Aïn Berriche Skeletons 3A-4 and 3A-7".

Quaternary International 320 (2014) 92–108

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Capsian mortuary practices at Site 12 (Aïn Berriche), Aïn Beïda region, eastern Algeria

Mary Jackes, David Lubell*

Department of Anthropology, University of Waterloo, Waterloo, ON N2L 3G1, Canada

ARTICLE INFO

Article history:
Available online 21 September 2013

ABSTRACT

Site 12, a Capsian escargotière in eastern Algeria, was excavated in 1930 by a joint expedition from the Logan Museum of Beloit College led by Alonzo W. Pond and the University of Minnesota led by Albert E. Jenks, assisted by a number of undergraduate and graduate students. Among the finds recovered were a large number of human skeletons, some of which undoubtedly date to the Capsian use of the site in the early and middle Holocene. Several of these display unusual mortuary practices and there is evidence for removal of bones, some of which were then modified for either utilitarian or ritual/symbolic purposes.

1. Introduction

Between 1925 and 1930, the Logan Museum of Beloit College sent several archaeological expeditions to Algeria, primarily to excavate Capsian sites. Because land snail shells are such a major visual component of these sites, they are often called *escargotières*, but the more correct term is *rammadiya* (from the Arabic ramad) because of the enormous quantities of ash in the deposits (Gobert, 1937; Mulazzani et al., 2009, p. 32). Many of the sites which were the focus of the 1930 work had been located previously by Alonzo W. Pond, the leader of the expeditions, or by local French/Algerian archaeologists working in the region around the towns of Aïn Beïda and Oum el-Bouaghi (then called Canrobert) between Tebessa and Constantine (Pond et al., 1928, 1938; Green et al., 2013). The 1930 expedition included students from several universities. These were: Beloit College: Robert Krieger, Virgil Moen, Charles Nash, Daniel Reidel, Edgar Roberts, Robert Voight, Kenneth Williams; Northwestern University: Robert Greenlee; University of Wisconsin: John Gillin, Lauriston Sharp, Sol Tax. In addition, there was a smaller team from the University of Minnesota team led by Albert E. Jenks and his wife Maud Huntley Jenks, assisted by Ralph Brown and Lloyd Wilford. Wilford acted as supervisor, having had extensive prior experience under Jenks' direction excavating hundreds of human skeletons at Galaz, a major Mimbres site in New Mexico (Anyon and LeBlanc, 1984). Some of the results were published (Pond et al., 1938) and a 1992 symposium honoring Pond (Breitborde, 1992) provided additional details (Johnson, 1992; Lubell, 1992; Sheppard, 1992).

So far as we can determine, the Logan Museum expedition excavated at least six sites in 1930 (nos. 10, 12, 14, 25, 26, 51: Site 10 was also examined in 1929), but the Minnesota team excavated only at Site 12 where an unconfirmed number of human skeletons were found, many of which were considered not to be prehistoric (Pond et al., 1938, pp.105–107). We know that thirty skeletons were packed and sent to the United States for study (Pond, 1931, p. 45) but this count may not have included the eight skeletons excavated by the Minnesota team which are the main subject of this paper. These were sent to Minneapolis and although studied – presumably by Lloyd Wilford (Anonymous, 1930b, 1935) – were never published. An earlier article (Haverkort and Lubell, 1999) discussed some aspects of these skeletons. Here we will describe and analyze the excavation and interpretation of Site 12 and the very unusual mortuary treatment of these human remains.

The excavations at Site 12 are only semi-documented, despite the 1938 publication, the student field diaries, letters and accounts, the still photograph and cinema records (a professional photographer was present in 1930) and the field drawings. While we have some diaries and letters, it is known that the Beloit records contained more detailed information which we have not seen and which may have been lost. Available records for the University of Minnesota trench are far more detailed and complete than those for the Beloit team. Forms for finds in the trench or on survey and records of laboratory work and photographs were made by Wilford and Brown who began work before Jenks arrived. Despite the survival of the University of Minnesota documents, major questions remain about provenance of the skeletons excavated by the Beloit team and we know of no overall plan for Site 12. Our work on the

* Corresponding author.
E-mail address: dlubell@uwaterloo.ca (D. Lubell).

1040-6182/$ – see front matter © 2013 Elsevier Ltd and INQUA. All rights reserved.
http://dx.doi.org/10.1016/j.quaint.2013.08.031

field records and photographs archived at the Logan Museum, Beloit College (LM), the Laboratories of Anthropology, University of Minnesota (UM), and the Wisconsin Historical Society, Madison (WHS), combined with detailed study of the skeletons excavated by the Minnesota team and new radiocarbon dates allow us to propose the reconstruction offered here.

2. Site location

The location of Site 12 is shown on the map in Pond et al. (1938) with the gradian coordinates of 39G 88′ N, 5G 59.5′ E (Pond et al., 1938, p. 240). We can convert these to 35° 53′ 31.2″ N, 7° 22′ 21.8″ E, taking into account the measurement from the Paris Meridian. The location of the expedition camp described by Dorothy Pond (2013) is misleading, but we can rely only on features in her account that are confirmed by photographs. The 1:50,000 topographic map for the area (Institut Géographique National, 1950) which is based on 1942–43 surveys, shows a "signal tree" at the precise location of the view shown in a photograph (WHS 30-177; another photograph, WHS 30–67, also shows the trees and camp as seen from the site). Plate 63 No. 1 in Pond et al. (1938, p. 96) confirms that the archaeological site was beside a track and above a stream, which accords with Pond's description (Pond et al., 1938, p. 95) of the site as on a slope to the east of Aïn Berriche. Vaufrey (1955, p. 231) writes that the site was located "Sur la route d'Aïn Beïda à Berriche, environ 12 kilomètres au Nord-Nord-Ouest de la ville, et immédiatement auprès du cimetière situé à 2 kilomètres au Sud de cette localité (vers 900 mètres), au Nord-Ouest de la source voisine…" The spring, Aïn Berriche, is shown on the topographic map.

The topographic map also allows us to identify the location of the well, and the site is visible on satellite images in relation to the well. The 2004, 2009 Google Earth images place the well at 35° 53′ 49″ N, 7° 21′ 51.50″ E and the centre of the escargotière area that was trenched can be identified at 35° 53′ 45″ N, 7° 22′ 9″ E (Fig. 1).

Fig. 1. Location of site. The inset shows the location of Berriche in eastern Algeria. The approximate positions and dimensions of the trenches are reconstructed from still and moving photography, Wilford (1930b) and Pond et al. (1938). Key 1) Beloit Main Trench; 2) Beloit trench 2 or 12A; 3) Beloit trench 3; 4) Minnesota trench. The dashed line approximates what appears to be a concentration of ashy deposit visible in the satellite image which we interpret as an estimate of the current extent of the escargotière deposits. The feature to the north is part of the cemetery mentioned by Vaufrey (1955, p. 231). N mag refers to the declination for 13 March 1930 (http://www.ngdc.noaa.gov/geomag-web/#declination). Image from Google Earth, 21 September 2004. Scale in metres.

3. Excavation methods

Pond (1928, pp. 17–24) described the method of excavation used first at Mechta el-Arbi in 1926 and then again at Site 12 and the other sites investigated by the Beloit team. They cut a trench beginning at the edge of the mound and worked towards the centre. Four such trenches were opened at Site 12 (Fig. 1). The first, or main trench, was described (Pond et al., 1938, p. 121) as starting from "the pist (*sic*) to Berich" and extending for 19.5 m on the west slope of the mound (Voight, 1930a). Wilford (1930b, 10 March) describes laying out the Minnesota trench to the south west of, and parallel to the Beloit trench, so it is possible to reconstruct the general course of the main trench.

The main trench was excavated by the Beloit undergraduates as a "training trench". It was begun by three more experienced students from other universities (Greenlee, 1930, 1 March), cutting into the slope. Initially there were two levels, but the students appear to have decided to excavate the trench without levels (Greenlee, 1930, 13 March), perhaps because of problems with keeping material separated for sieving (Tax, 1930, 11 March). From 17 March the work was done by Williams and he later established four arbitrary levels (Williams, 1930a). If the trench began with straight sides, it did not continue that way, since Williams (1930b, 7 April) mentions having "found it necessary to dig out wall of east side of trench to expose leg bones" of one skeleton. Plate 72, No.1 in Pond et al. (1938, p. 114) makes it clear that the main trench was quite complex. We know that it was 19.5 m long and could have been about 3 m deep except for the final 3 m which were not fully excavated. It began as 3.5 m wide (Pond et al., 1938, pp. 97, 121 and Fig. 3), but Voight (1930a) mentions a width of 15 feet [4.6 m]. In the main trench after 28 March (Williams, 1930a) and in other trenches opened up by the Beloit students, thick artificial levels of 55, 60 or 65 cm were used. All excavated deposit was screened through ¼ inch mesh. Pond's methods were developed at Mechta el-Arbi where he worked with Debruge and the justification for them is laid out in Pond et al. (1928). They were not so sophisticated as those used in Europe at the same time at Mesolithic shell middens with burials (Péquart, 2007; Jackes et al., 2011).

The other trenches excavated by the Beloit team at Site 12 were laid out with stakes (Wilford, 1930a, 15 March). Trench 2 was on the opposite (east) side of the mound from the main trench. Voight (1930b) says the plan was for the two Beloit trenches to meet at the center, so that there would be a complete section through the mound. The plan must have been provisional because by 7 April, Voight (1930c) wrote that "The three trenches being worked on site twelve are all well underway toward converging at the center… provided that the camp is not moved to a new location before the three months' period of expedition work is up".

The width of the mound was thus more than 35 m. Site 12 was described as a "huge escargotière" (Pond et al., 1938, p. 107) and "by far the largest… in the region" (Pond et al., 1938, p. 109) although no precise dimensions are recorded. Based on the records and what we can see on the Google Earth 2004 satellite image, we estimate the SW to NE diameter exposed in the trenches as around 60 m.

Trench 2, also called Trench 12A, measured 3 × 15 m and was excavated by two more advanced students, John Gillin and Lauriston Sharp from the University of Wisconsin. It was dug in five arbitrary levels of 60 cm each and more detailed records were kept in order to try and recognize what Pond thought to be a difference in lithic artifacts between the upper and lower levels (Pond et al., 1938, p. 125) which almost certainly correspond to the difference between Typical and Upper Capsian (cf. Jackes and Lubell, 2008 with references; Rahmani, 2004; Sheppard, 1987).

Trench 3 measured 3 × 4 m (Tax, 1930, 16 March), was located on the south face of the mound, and was excavated by Robert Greenlee and Sol Tax in three arbitrary levels of approximately 55 cm each (Pond et al., 1938, p. 123). Tax noted the trench was laid out with compass and tape and oriented exactly N–S. Trench 3 appears to have contained a mixture of prehistoric and later (Roman) materials (Greenlee, 1930, 18 March and 17 April). Greenlee (Greenlee, 1930, 16 March) says that they cleared the trench to a clay bottom which may have been underlain by "a natural limestone ledge". He further notes (Greenlee, 1930, 18 March) that they encountered the "same clay ledge formation as found at trench worked by Jenks' party".

The University of Minnesota group, consisting of Jenks, Wilford and Brown (Johnson, 1992), opened a fourth trench, parallel to the main trench, but this is not discussed in Pond et al. (1938) and the only published reference to their work is a note in *Science* (Anonymous, 1930a). They used imperial measures whereas the Beloit team followed the metric system, and therefore we give metric equivalents in square brackets. The trench was excavated under the direction of Wilford assisted by Brown. Each kept a diary and they made field notes as well as several plots which we have used in our reconstruction (Fig. 2a, b). The trench measured 10 × 60 ft [3 × 18.3 m] and was excavated to a depth of nearly 10 ft

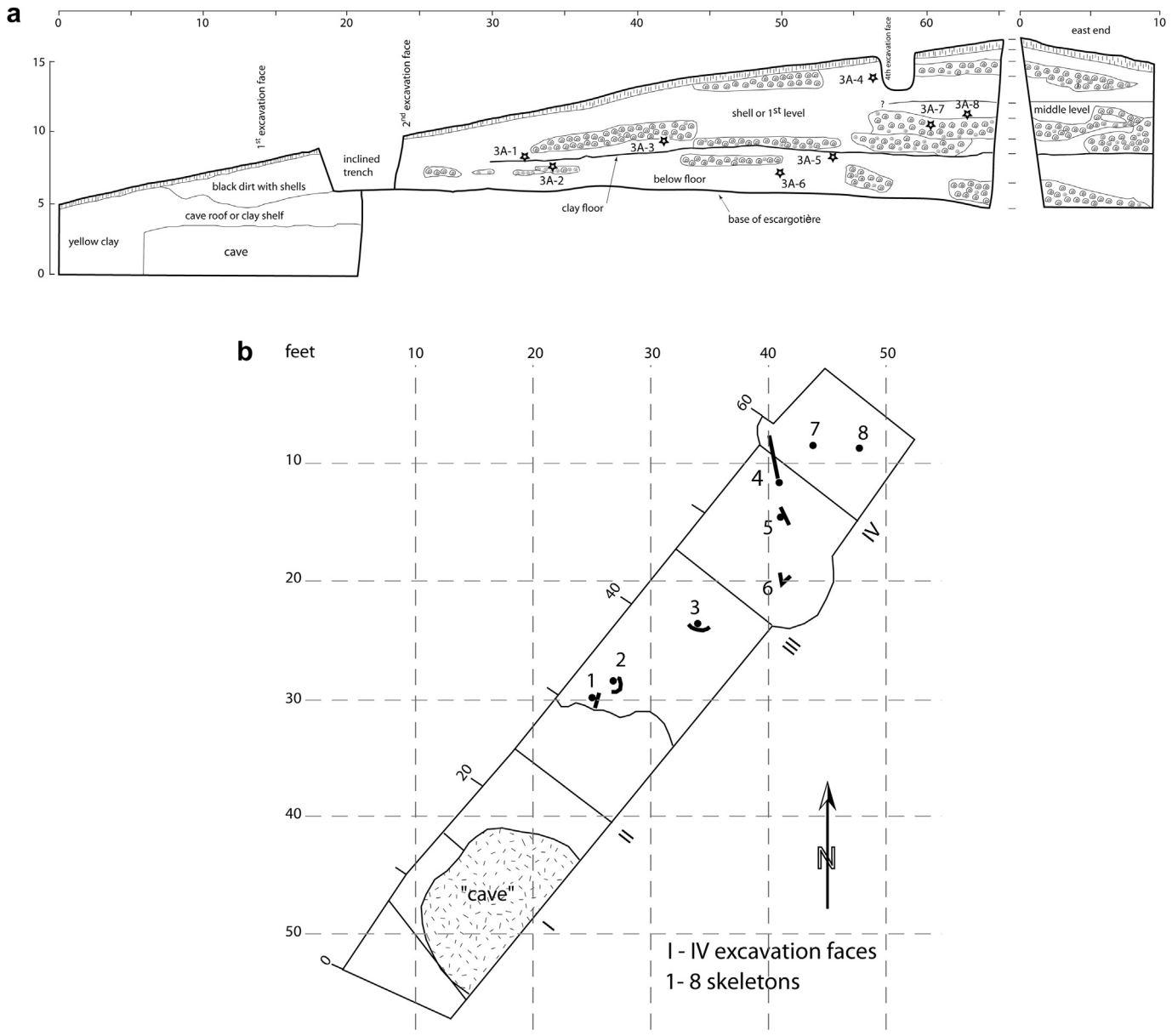

Fig. 2. a. Minnesota trench profile of north wall. Scale in feet. Based on an original sketch by Lloyd Wilford in the archives of the Anthropology Laboratories, University of Minnesota. b. Minnesota trench plan. Grid scale in feet; magnetic north for late March 1930 shown. Based on an original sketch by Lloyd Wilford in the archives of the Anthropology Laboratories, University of Minnesota.

[3 m]. From Wilford's plot and our reconstruction of the site it appears that the general trajectory of the trench was from SE to NW at about 30° off cartographic north.

4. Excavation results

One of the reasons why it is difficult to determine how many skeletons the Beloit party actually shipped to the United States is because Pond considered many of them to be intrusive and not contemporaneous with the prehistoric occupation of the sites. He may have had some basis for this interpretation, because Balout (1955: 13) notes that escargotières in the Tebessa region served as cemeteries during historic times, especially during the 1884 famine. However, in discussing Site 10 Pond wrote "The skeletons (detailed account to be published later) were found all over the summit of the mound. All seemed to be intentional burials" (Pond et al., 1938, p. 109). This may suggest that the skeletons he considered intrusive were nonetheless shipped to North America for study. Of the material Pond considered to be contemporaneous with the shell midden, he wrote, "Those human remains which are a part of the escargotières are almost always either flexed, pell-mell or fragmentary. Frequently, a skull or parts of a skull are found among the snail shells. One skeleton was found which had seemingly been decapitated and the head buried with the rest of the body". He continues: "the distorted, flexed position of many skeletons, the pell-mell skeletons and the disconnected fragments of skeletons, all *in situ*" lead him to think that the dead were simply abandoned with "'burial' being the result of wind and weather" (Pond et al., 1938, p. 107). Pond, while observing that ochre was often associated with the skeletons, downplayed its importance (Pond et al., 1938). Nevertheless, in the Minnesota trench Wilford (1930a, various dates) noted variations – some ochre for most skeletons, a great deal of ochre for one skeleton, no ochre at all with a child of around 11 and with an infant burial.

An undetermined number of human skeletons was found in the three Beloit trenches at Site 12. The best estimate we can make from the available records is a total of 39: 16 in the Beloit Main Trench, 14 in Beloit Trench 2, one in Beloit Trench 3 and eight in the Minnesota trench. Unfortunately, no complete inventory or analysis exists and the present location of many is uncertain although they were most likely returned to Algiers (Balout, 1955; Aoudia-Chouakri, personal communication, October 2010) from Chicago where they had been sent to be studied by Faye-Cooper Cole at the Field Museum – a study for which there is no record. A voluminous correspondence survives in the Logan Museum archives regarding these skeletons. Camps-Fabrer (1966, pp. 180–181) states that a "trophy skull", a perforated human occipital, had been returned to the Bardo Museum in Algiers from the United States and could be seen there in 1959. What else was returned, or to where, remains unclear, but the archived correspondence makes it certain the material is no longer at the Field Museum, and we know it is not at the Logan Museum. Vaufrey (1955) stated that Balout had negotiated the return of the skeletons to Algeria and this is confirmed by Balout (1955) who thanks L. Cabot Briggs for helping.

The Beloit Main Trench at Site 12 yielded 11 skeletons according to Voight (1930d), but he was wrong: at least 16 complete or fragmentary skeletons had been discovered by the time the trench was abandoned on 16 April (it was apparently left open, although the other trenches were backfilled), and there are indications that a stray mandible was not numbered (Williams, 1930b, 31 March). Trench 2 may have contained a significant number of skeletons since three photographic negatives exist in the Logan Museum archive which are identified as "H" (30–404), "I"(30–405) and "N"(30–408), suggesting at least 14 were found. Trench 3 yielded one child represented by a partial skull and some long bone fragments within 50 cm of the surface (Greenlee, 1930, 1 April).

A further problem lies in the several mentions (Pond et al., 1938, pp. 109–139) of skeletons and/or skulls found at other sites: (at least 11 at Site 25, five at Site 51, "many" at Site 10) for which we have found no records other than a few photographs. We have some knowledge of Site 25 from Greenlee's (1930) diary. He worked there from 25 April to 23 May and describes the finding of 11 skeletons most of which were apparently deemed to be "intrusive" (Pond et al., 1938, p. 135). Several identified photographs attest to the discovery of skeletons at Site 10. Two of the photographs show paper labels beside skeletons, the numbers 15, 16 and 17 being discernible.

Pond set rules for the students (Pond, 1931, pp. 52–53; Tax, 1930, p. 22), specifying that all material must be labeled and skeletons excavated with special care. Fragile material was strengthened with shellac and rice paper before being lifted, and there is no mention of, or evidence for, skeletons being removed *en bloc*. Cards were made with details of the location and state of each skeleton (Voight, 1930d). Unfortunately, these have disappeared and since we do not have all the students' dairies and notes, nor the essays which we know were written (e.g. Roberts, 1930, 19 April, says he had finished the first 3000 words of his "thesis" on Site 12), we do not have complete descriptions of what they found.

5. The Minnesota Trench skeletons

Between 21 March and 16 May, 1930, the Minnesota team found eight skeletons in their trench. These were numbered from 1 to 8 in the order of their discovery, and their provenance is shown in Fig. 2. Skeleton 4, the uppermost, was complete and lay in an extended position on its right side. Since none of the others were extended burials, Skeleton 4 was considered to be intrusive (Wilford, 1930a, 10 April). This accorded with Pond's opinion on extended burials (Pond et al., 1938, p. 105), and his view that those skeletons which were not intrusive had simply been left unburied (Pond et al., 1938, p. 107). Pond's only mention of the Minnesota trench is his unspecified reference to a decapitated skeleton (Pond et al., 1938) which must be Minnesota Skeleton 3A-1 (Fig. 3a).

5.1. Stratigraphic position

The northwest wall of the Minnesota trench (Fig. 2a) illustrates a stratigraphic situation well known from many Capsian sites (Gobert, 1937; Pond et al., 1938, pp. 95–101; Camps-Fabrer, 1975; Lubell et al., 1976, 2009) in which lenses of whole land snail shell are intercalated with lenses of crushed shell in a matrix of ash and large amounts of fire-cracked rock, with abundant vertebrate remains and lithic artifacts.

The somewhat unusual situation here is the hard clay stratum dividing the deposits. Similar stratigraphic divisions have been noted at other Capsian sites – Aïn Misteheya and Kef Zoura D (Jackes and Lubell, 2008; Lubell et al., 1975, 1982–83, 2009) – but for the most part the excavation methods employed at Capsian sites have not permitted such observation. The skeletons lay both above and below the hard clay (referred to by Wilford as a "floor").

Another unusual feature is the "cave" (Fig. 2a,b) which was plotted and discussed by Wilford. It lay at the foot of the mound and contained no *in situ* Capsian material. We cannot tell whether it was formed in the bedrock or sterile substrate upon which the site was established, or was part of a calcareous crust below the archaeological deposits – both situations are known to occur in the Maghreb. It might also be the remains of a spring which was no longer active, as Capsian sites were often located close to springs.

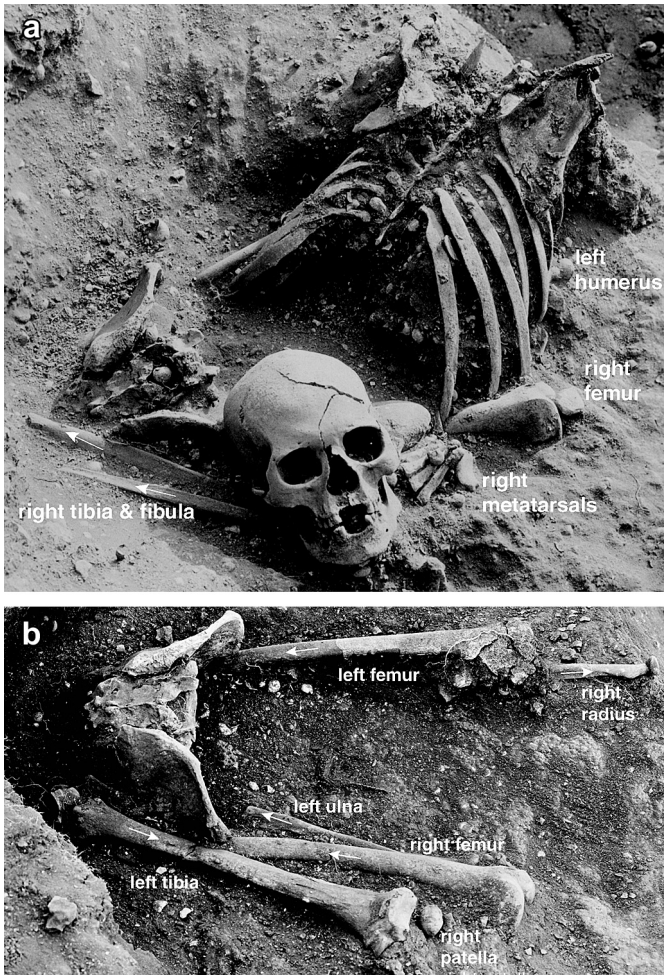

Fig. 3. a. Skeleton 3A-1. Arrows point to proximal ends of bones (Logan Museum of Anthropology, Beloit College, negative 30-109). b. Skeleton 3A-1 after partial excavation, showing pelvis and long bones: arrows point to proximal ends of bones. The right patella was recorded as having been originally correctly in place (Logan Museum of Anthropology, Beloit College, negative 30-106).

5.2. Age, sex, provenance and burial disposition

We have been able to make detailed observations on seven of the eight skeletons identified as Capsian (designated as 3A-1, 3A-2, 3A-3, 3A-5, 3A-6, 3A-7, 3A-8 in the University of Minnesota accession catalogue and labeled accordingly on the specimens) which are on loan to us for long-term study. The eighth, 3A-4, is the adult skeleton thought to be intrusive and which remains at the University of Minnesota where we examined it briefly in December 2002. Skeletons 3A-1, 3A-2, 3A-5, 3A-6 and 3A-7 are adults and have evidence of cutmarks (Haverkort and Lubell, 1999). Re-examination for this paper of the sub-adult skeleton 3A-3 has also identified possible cutmarks. The infant Skeleton 3A-8 has no cutmarks, nor did we observe any on 3A-4. For skeletons 3A-1, 3A-2 and 3A-5 there are photographs taken during excavation which we have been able to compare with the bones, thus allowing us to reconstruct aspects of the burial. This has only been possible because we can compare bones with photographs as well as the descriptions and measurements made by Wilford (Anonymous, 1935). For 3A-6 there is a sketch in Wilford's notes which we have redrawn and reproduce here as Fig. 11 that also allows some reconstruction of the burial since we can compare the sketch to the bones.

5.2.1. Skeleton 3A-1

Skeleton 3A-1 was found with the torso lying ventral side down and the skull separate from the torso. It was interpreted as a kneeling individual who had been decapitated (Fig. 3a). Wilford identified the skeleton as female. Fig. 3a provides a good example of a characteristic of Capsian cranial remains, dental avulsion of incisors in life (Lubell et al., 1984; Humphrey and Bocaege, 2008), also noted by Wilford. All incisors of 3A-1 had been removed and the alveolar regions were resorbed and thinned. Wilford also provided measurements taken *in situ* which we have used in our reconstruction of the burial based on his description and the photographs. Since this was an early find and the most complete, it is the best recorded with multiple photographs and extensive notes (Wilford, 1930a,b).

Wilford's field notes, which we paraphrase below, describe it as follows:

> The torso lay on the stomach with the scapulae on top and pelvis in approximately the correct position. The skull, was set on its base with the jaw closed, facing out from beside the right innominate. There was a large rock under left side of skull. Some of the vertebrae in the area of the pelvis were not in place ["sagged down" was Wilford's phrase]. One femur (the left?) lay with the distal end under the body, the right femur lay under the back of the head with the knee end to the right of the ribs and the patella in place. One lower leg extended from the pelvis to the chin with foot bones to the left of the chin. The body was fully flexed, with both femora parallel and under the body.

Wilford found the placement of the lower leg bones very confusing. Fig. 3a shows that the right tibia and fibula lay reversed diagonally beside the right pelvic bone, with the right foot beside the mandible. The right metatarsals II, III and IV can be seen quite clearly (dorsal view). The left tibia as shown in Fig. 3b is a complete, easily identifiable bone – as it remains today – whereas the right has the lateral proximal damage seen in Fig. 3a. The left tibia was positioned correctly with regard to the knee, but lateral to the right femur. The photograph suggests that the left talus lay distal to the left tibia near the right iliac blade.

Wilford's notes continue (paraphrased):

> The left humerus had its proximal end in the socket, passing under the body. The left radius and ulna had their proximal ends forward under the body directly below the scapulae. The distal ends lay straight back under body and in line with it. The right humerus had its proximal end in the socket and lay back on the right side of body. The right radius and ulna were together with the proximal ends to the rear.

Again there is a problem with Wilford's notes. The radius and ulna that lay on the right side of the body did, indeed, have their proximal ends pointing forward, but they were both left side bones. The radius clearly shown in Fig. 3b is the right radius and it was thus beside the left knee. Despite his prior expertise in the excavation of human remains, Wilford clearly found this skeleton a problem, which is understandable given that it is quite extraordinary.

Wilford must have assumed that the left humerus was within the glenoid fossa, but that cannot have been correct. While it is true that the left scapula was pulled laterally, the placement of the left humerus was such that the bone lay diagonally with its distal end extending beyond the second rib, suggesting that the left shoulder was not held firmly in place by a complete soft tissue envelope (the head had in fact been broken across from side to side). The left elbow must also have been disarticulated although no cutmarks are evident, but the forearm and proximal and distal row of carpals

remained as a unit. A legitimate question is whether this unit could have moved into position inside the right knee during the process of decomposition. If it lay under the neck, it would have remained cranial to the humerus. Decompositional movement could only have happened if the left forearm lay outside the rib cage, but its passage would have been blocked by the stones alongside the right ribs as well as by the right femur and patella. The evidence is that the forearm and hand had been placed palm up beside the right femur.

The right forearm was not a unit. It could not have moved as a unit and the elbow joint was apparently disarticulated. This interpretation is supported by the multiple cutmarks, both medial and lateral, on the right distal humerus. The right ulna and radius were on the left side of the body with the right ulna pressed against the left ribs. The olecranon lay with the trochlear notch face down close to the left iliac crest, i.e. the proximal end was beside the left hip. The radius overlapped the ulna by no more than 5 cm with its proximal end pointing cranially.

Wilford included a series of measurements that locate the skeleton in the profile (Fig. 2a) and describe the provenance. A shallow depression was scraped out of a floor of yellowish clay. Based on photographs and Wilford's notes, we know that the depression was 74 cm in axial length, that it sloped very slightly from side to side under the femora, and that the cranial end sloped upwards about 8 cm beneath the rib cage. The upper spine, ribs and scapulae were supported by hearth material, including many small rocks. The skeleton was described as buried "through" a hearth in which there were ashes, charcoal and red ochre as well as many whole and crushed snail shells. It lay within this hearth deposit and some yellowish clay, mixed with ash and charcoal, was at both sides. Material scraped from the clay floor, mixed with crushed shell, was deposited on top of the skeleton. Wilford noted that 2 ft [60 cm] to the north of the skeleton there was a 1 ft^2 [0.09 m^2] area in which the matrix was heavily mixed with red ochre.

The bones show very little evidence of red ochre apart from the inner surfaces of some ribs. It appears possible that hearth materials were pushed into the rib cage thus helping to maintain its volume. Fig. 3a shows that the lower left ribs have moved (the right lower ribs are similarly displaced but not so clearly seen): some ribs lay below, some beside and some above the fill. Left rib 9 lies above the fill and at the point at which it pushes against left rib 8 the latter has a spiral fracture 5 cm in length. Since the available photographs give no indication of a fill composed primarily of fine sediments able to flow smoothly into empty spaces, the suggestion is of some means of immediate rather than progressive infilling of the thoracic cavity. It is noteworthy that while recording the existence of the yellow clay capping above the skeleton, Wilford did not mention any slumping of skeletal elements except for some "sagging" in the vertebral column. Since the first lumbar vertebra had non-rotatory superior zygapophyses, the instability of the thoracic spine would have been increased. Nevertheless, we have no reason to believe that the lumbar vertebrae had been displaced, particularly because the end plates are very clean whereas parts of the neural arches and walls of the centra are blackened, not by burning but apparently by clinging dark hearth deposits. The relative lack of discoloration on the end plates is carried on into the thoracic spine. Only the superior L.2 endplate is heavily stained. While details of cleaning of the skeleton cannot be known, the general picture seems to be that Wilford was correct in describing the spine as complete but slightly "sagging", probably in the thoraco-lumbar region.

The pelvic basin volume was also maintained without collapse, a situation not unique at this site. Immediate filling, together with the external pressure exerted by long bones and stones, seem to have resulted in this unusual lack of collapse following decomposition. The presence of yellow clay from the underlying floor beside and especially above the body supports the interpretation of immediate infilling, without collapse. A "wall effect" (Duday et al., 1990) whereby skeletal elements are kept in place by stones, bones and heavy fill requires a countervailing filling of inner spaces, and this seems to have been the case here.

We will discuss later (9.1.1) cutmarks in ethnohistorically documented North American instances of secondary burials. The case here is quite different. There is every indication that 3A-1 was not completely disarticulated and that any post-mortem manipulation occurred while the majority of joints still maintained some degree of integrity. The infilling of the body cavities suggests that inner organs were at some point removed. There is only limited evidence (three places with identifiable cutmarks – see Haverkort and Lubell, 1999, Table 1 and Fig. 6) for intentional dismemberment, suggesting that final deposition of the body was sufficiently long after death for various portions to be separated without requiring extensive use of cutting implements directly against bone. The axis must have been removed by the excavators and discarded prior to their initial discovery of the head of the right humerus, because poor weather led to imperfect excavations. On 27 March, the humerus of 3A-1 was immediately evident, now exposed on the excavation face. The axis may well have been damaged by extensive cutting since the mandible bears cutmarks. The atlas (with spina bifida occulta) and hyoid together with its fused corni must have been with the skull and display no cutmarks. The left frontal region sustained a massive blow, but whether this occurred peri- or post-mortem cannot be determined.

We cannot agree with Pond's insistence that Site 12 bodies were left on the surface to disarticulate naturally. There is no sign of weathering or gnawing; the bones must have been protected from weather and scavengers such as jackals. They could not have been left to be scuffed and damaged and spread by people moving around a living area. Skeleton 3A-1 was first buried immediately after death. We have no way of knowing the original disposition of the body, but suggest that it was manipulated in place, without relocation, and that 3A-1 was partially dismembered prior to final deposition. The cutmarks on the mandible, the distal right humerus and the proximal left tibia are consistent with the removal of the head and disarticulation of at least one elbow and one knee.

Extraordinary as this interpretation might seem, we will show that at this site skeletons vary from complete extended burials (always interpreted as intrusive) to isolated fragmentary skulls. In association with the finds of tools made from human bone at this and other sites, we suggest that there was ongoing harvesting of bone from human burials. Skeleton 3A-2 is an example of such post-mortem manipulation.

5.2.2. Skeleton 3A-2

Skeleton 3A-2 (Pond 13) was found very close to 3A-1, but slightly below (5.5 in or 14 cm) the clay floor (Fig. 2a) which Wilford describes as having been "broken above it". It was surrounded by ash and a considerable amount of red ochre, especially just behind the skull. The skeleton lay on the right side, flexed in a curve, and missing both legs, the right humerus, the left arm and the left hand (Fig. 4).

Skeleton 3A-2 poses a problem. In his field notes for 2 April 1930, Wilford described it as in poor condition, the pelvis "too crushed to determine sex". In the unpublished analysis almost certainly written by him (Anonymous, 1935), the pelvic girdle is said to be "badly crushed". In fact, the material labelled as 3A-2 in the Minnesota collection has two perfectly preserved pubic symphyses, and can be confidently sexed as female. Furthermore, there is the hyoid, a fragile and rarely seen bone in archaeological samples, as well as an ossified thyroid cartilage with its greater cornu or extension joining the end of the hyoid.

Fig. 4. Skeleton 3A-2 exposed (Logan Museum of Anthropology, Beloit College, negative 30-114).

In the 1935 report, the 3A-2 skull is described as "badly broken cannot be reconstructed for dependable measurement. The only sizable section… is the left parietal with parts of right parietal and occiput adhering, badly warped". We certainly do not seem to have the skull shown in Fig. 4. What we have are fragments, many with breaks that look recent (Fig. 5). The skull was shellacked and lifted for transportation to the camp where cleaning obviously led to fragmentation. In his diary for 1 and 2 April 1930, Wilford wrote:

> Skull in very poor condition. Back curved around, pelvis tipped up and badly crushed and out of shape, as well as beheaded… The only good pieces were the bones of the rt forearm. The skull we soaked in shellac and got out in the matrix just as it was in the ground [The lifting of the skull by Wilford is shown in a film made by Jenks].

He described the upper and lower central incisors as missing, and we can confirm from the mandible (Fig. 6a) that they had been extracted *in vivo*. The only cutmarks we observed were on the posterior surface of the atlas, suggesting the skull had been separated from the vertebral column post-mortem and placed separately in the grave, thus accounting for its position surrounded by the innominates.

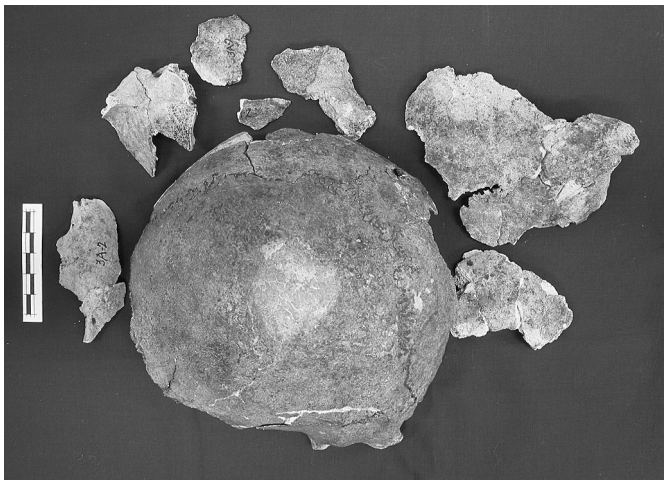

Fig. 5. Skeleton 3A-2 skull fragments.

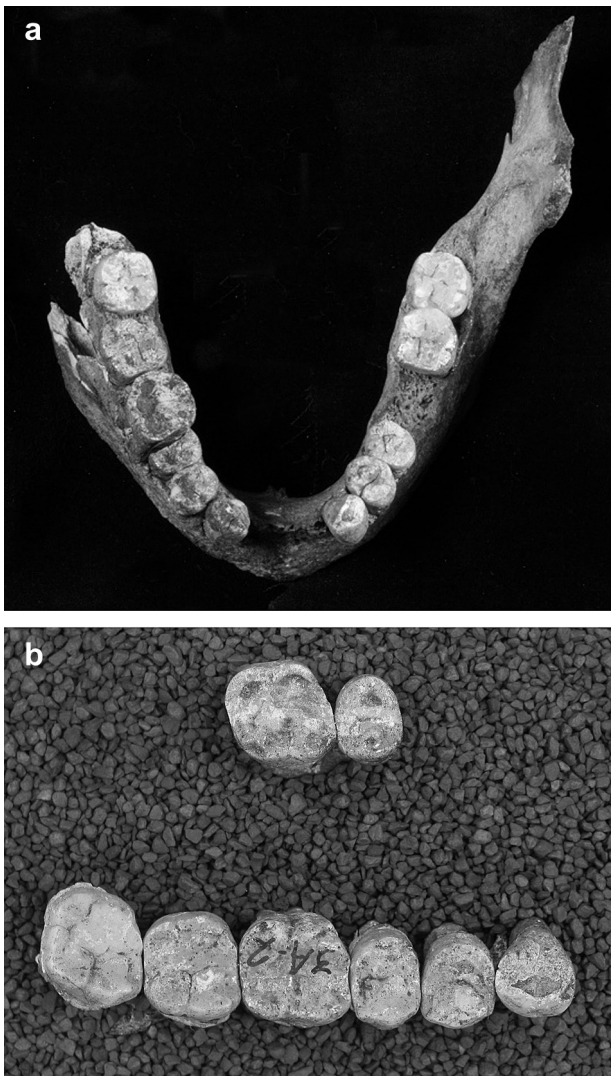

Fig. 6. a. Skeleton 3A-2 mandible, occlusal view. b. Skeleton 3A-2, reconstructed maxillary dentition showing duplicate teeth.

Fig. 6b shows the reconstructed left maxillary arch of 3A-2 and demonstrates another part of the problem – there are two left maxillary P4s and two left maxillary M1s. The extra teeth must have belonged to a slightly older individual. In addition, we have frontal processes of the zygoma which clearly belong to two individuals, one much larger than the other, the larger one having been burnt. We thus appear to have fragments of two faces: a small right supraorbital region and zygomatic arch to go with the small zygoma, and the larger burnt zygoma which belongs with a heavy glabella region and an unburnt left zygomatic arch. Quite a few non-human elements were also labeled as 3A-2 and so the area of the partial skeleton was obviously a mixed context.

5.2.3. Skeleton 3A-3

Skeleton 3A-3 is a sub-adult identified by Wilford as a child of 11 years and described as poorly preserved. It was located above the clay floor, just over 3 ft [91 cm] below the surface (Fig. 2a) in a hearth deposit of ash and charcoal between a shell lens and the clay floor. No ochre was found but there was a "fine flint blade at feet".

Fig. 7. Skeleton 3A-3 (Anthropology Laboratories, University of Minnesota, photograph 5215).

The skeleton lay on the right side with the vertebral column oriented N–S, the knees fully flexed and close to the shoulders, the pelvis "almost upright" and the skull "near middle of vertebral column" resting upside down with the face towards the pelvis. The right arm "pointed upward with forearm lying back behind head". All teeth were present. There was no evulsion of incisors. This is not evidence that the skeleton was post-Capsian because a broken remnant of upper incisor root in a skull from the Grotte Hyène, collected by Debruge and numbered 4–254 in the University of Minnesota collection, shows that evulsion may not have been carried out until after that root had completely formed (see also Humphrey and Bocaege, 2008). Fig. 7 shows that the left knee was hyperflexed with the right knee beside it. Tarsals and metatarsals can be seen in the area beside and beyond the hip. The image is insufficiently clear to allow a definitive identification of all foot bones but suggests that the two feet lay together. The hyperflexion at the knee seems too great to accommodate the volume of soft tissue of an in-flesh burial: perhaps the bones were placed after some degree of decomposition, unless the individual was emaciated.

The location of the skull close to the pelvis, as in the two previous cases, seems to be an indication of intentional disarticulation. Since the skeleton is not well preserved, it is difficult to confirm that all long bones are present. The diaphyses of the left humerus and left radius seem to be absent and it is possible that no fragment of the left ulna has survived. While this may not be an indication of bone harvesting, it should be noted that there is a possible cut mark on the right clavicle. Furthermore, there are several possible cutmarks on the interior surface of two rib fragments, but these might have been caused by metal tools which may have been used when excavating or cleaning skeletons. In view of the position of the skull, even if there are no confirmed cutmarks it is not possible to argue that the absence of ochre indicates a lack of post-mortem manipulation.

5.2.4. Skeleton 3A-4

Skeleton 3A-4 was 15 in [38 cm] below the surface (Fig. 2a). A line of loose shells was found on either side of the skeleton and did not extend over it. The skeleton "lay in a mixture of black dirt and shell, and apparently was intrusive". It was fully extended, arms at the sides, and was "in [a] fair state of preservation, with [the] skull and pelvis crushed, and the right shoulder blade and one vertebra, out of place" (Fig. 8). Wilford identified it as adult, aged 30–35, with all teeth present. We examined it briefly at the University of Minnesota and agree there is no pre-mortem evulsion. We have no basis for saying whether or not this skeleton is prehistoric. Few details are included in the field records: since the skeleton was fully extended and near the top of the deposits, it was assumed to be intrusive. There is evidence from other Capsian sites such as Medjez II (Camps-Fabrer, 1975, pp. 301 ff.) for similar burials considered to be in prehistoric contexts, despite uncertain dating (Merzoug, 2013).

5.2.5. Skeleton 3A-5

Skeleton 3A-5, an adult male, was found 5 ft 11 in [1.8 m] below the surface (Wilford, 1930a, April 18) and beneath the clay floor (Fig. 2a) with the shoulders, upper vertebra and ends of the humeri protruding above it (Fig. 9). Wilford described the disposition clearly. The skeleton seems to have been sitting in a pit with the upper vertebrae to the west and the spine inclined steeply towards the pelvis. The legs were half flexed with both femora upright so that the knees were above the rest of the body. The humeri were at

Fig. 8. Skeleton 3A-4 in place (Logan Museum of Anthropology, Beloit College, negative 30-115a).

Fig. 9. Skeleton 3A-5 with arrows showing misplacements (Logan Museum of Anthropology, Beloit College, negative 30-401).

the sides, with the right forearm bent back to the right shoulder and the left forearm across body. The skull lay above the pelvis between the left humerus and a femur: it rested on the frontal with the occiput upwards and the mandible in place. There was some red ochre present. Wilford noted that the skull and left forearm were displaced, "the head of the ulna being nearly one foot from the distal end of the humerus".

Wilford states that both humeri were reversed, with the distal ends up, but this was no doubt a confusion of the words "proximal" and "distal". The distal humeri are well-preserved while the proximal humeri are badly damaged, as might be expected from being exposed by excavation through a hard surface. The right humerus preserves a break which is evident in the photograph. Wilford (Anonymous, 1935) noted that both humeral heads were missing.

While we might see the state of the skeleton as resulting from post-depositional collapse – the tibiae falling away from the knees – it becomes very hard to envisage how this could happen if the skeleton were surrounded by grave fill. Indeed, the skeleton must have been well buried because the bones are not weathered or gnawed. The elbows, for example, retain perfectly preserved marked arthritic lipping and also show clear, unweathered, cutmarks. While 3A-5 is complete, it is important to remember that there were cutmarks on the ascending ramus of the mandible, the atlas, both distal humeri and the proximal right ulna.

A poorly exposed photograph of Skeleton 3A-5 (Anthropology Laboratories, University of Minnesota, photograph 30-5213) viewed from the left side allows us to see that the right distal humerus was lying at a lower level than, and at some remove from, the right proximal radius and ulna, a lack of articulation which could result from post-depositional movement. The left elbow suggests a different interpretation. Wilford's observation that the left elbow was broadly dislocated is the first clear evidence that this is not simply a question of the body settling in the grave with decomposition. More compelling evidence for disarticulation comes from the right knee joint which was even further dislocated, with the right proximal tibia and fibula lying beyond the left thigh and the right foot extended across the rib cage from the left side. The left foot lay across the right elbow which was flexed beyond the right ribs, so that the right hand was on the right shoulder. Since we were able to check against the original bones, we can be certain of the identification of the bones in the photograph (Fig. 9). Finally, we have the skull and mandible upside down proximal to the left femur.

While it appears that no bones are missing from 3A-5 although many are in poor condition, there does seem to be particular damage to the cervical spine. Lumbar and thoracic vertebrae are evident from a photograph taken just before the skeleton was completely lifted: the atlas and part of the axis are present in the surviving collection, but the rest of the cervical spine is very fragmented.

Wilford discusses the deposits around 3A-5 in some detail noting that it lay below the clay floor identified beneath Skeleton 3A-1 (Fig. 2a). It seems likely that the floor here was 10 in [25 cm] thick and unbroken and that the tops of the humeri just protruded into the clay. Below this floor in the region of the skeleton the deposits were different, with black dirt and shell mixed and packed in, and some red ochre present. Below the skeleton there was a thick layer of looser shell.

There can be no doubt that 3A-5 was disturbed after death. The elbows may have been disarticulated since cutmarks are evident, while the lack of cutmarks in the knees may be a result of poor preservation, the proximal tibiae are fragmented. The fact that the hands and feet were still partly in articulation suggests that the location of the skeleton was not changed and that this is not a secondary burial long after death. The body cannot have been exposed on the surface and cannot have been moved far, yet it has been disturbed.

While we can be certain that 3A-5 was disturbed, the three available photographs do not give us a full picture of the way in which the skeleton lay. A defective image (Logan Museum of Anthropology, negative 30–401a), when clarified, shows the situation after the skull had been removed. The left posterior distal humerus was lying across the vertebral column and it appears that the thoracic spine, and thus the thorax, was positioned at a right angle to the femora in a quite deep pit. While it is difficult to envision the exact position of the left humerus, we know that all arm bones belong to this one individual and there were no additional bones because both elbows are very distinctive and arthritic.

5.2.6. Skeleton 3A-6

Skeleton 3A-6 was found 6 ft 2 in [1.9 m] below the surface and just below the unbroken clay floor. It lay on the right side in a mixed layer of black dirt and well packed shell, overlying a layer of looser shell. Some red ochre was present. It was poorly preserved "and in a very much mixed up position" (Wilford, 1930a, 25 April) missing the head as well as both arms and legs although all hands and feet were present. Fig. 11 shows a reconstruction based on the sketch in Wilford's field notes (Wilford, 1930a). The spinal column had been broken into two halves which met at an acute angle. The pelvis faced downward, and the scapulae were flattened out, one between the head of the vertebral column and the left ilium, the other at end of the left ilium. The left foot was at the head of the vertebral column. One hand was at the east end of the burial, while the other was above the right foot at the north end, at the place where the vertebral column was broken. Ribs were everywhere under these remains. There are cutmarks on two vertebrae, the sternum and several ribs (Haverkort and Lubell, 1999, Table 1 and Fig. 6).

5.2.7. Skeleton 3A-7

Skeleton 3A-7, an adult male, was found at a depth of 4 ft 11 in [1.5 m] from the surface, and 2 ft 2 in [66 cm] above the clay floor. It lay below an unbroken layer of dirt under the upper two levels. It

Fig. 10. Skeleton 8, Main Trench (Logan Museum of Anthropology, Beloit College, photograph 30-110a).

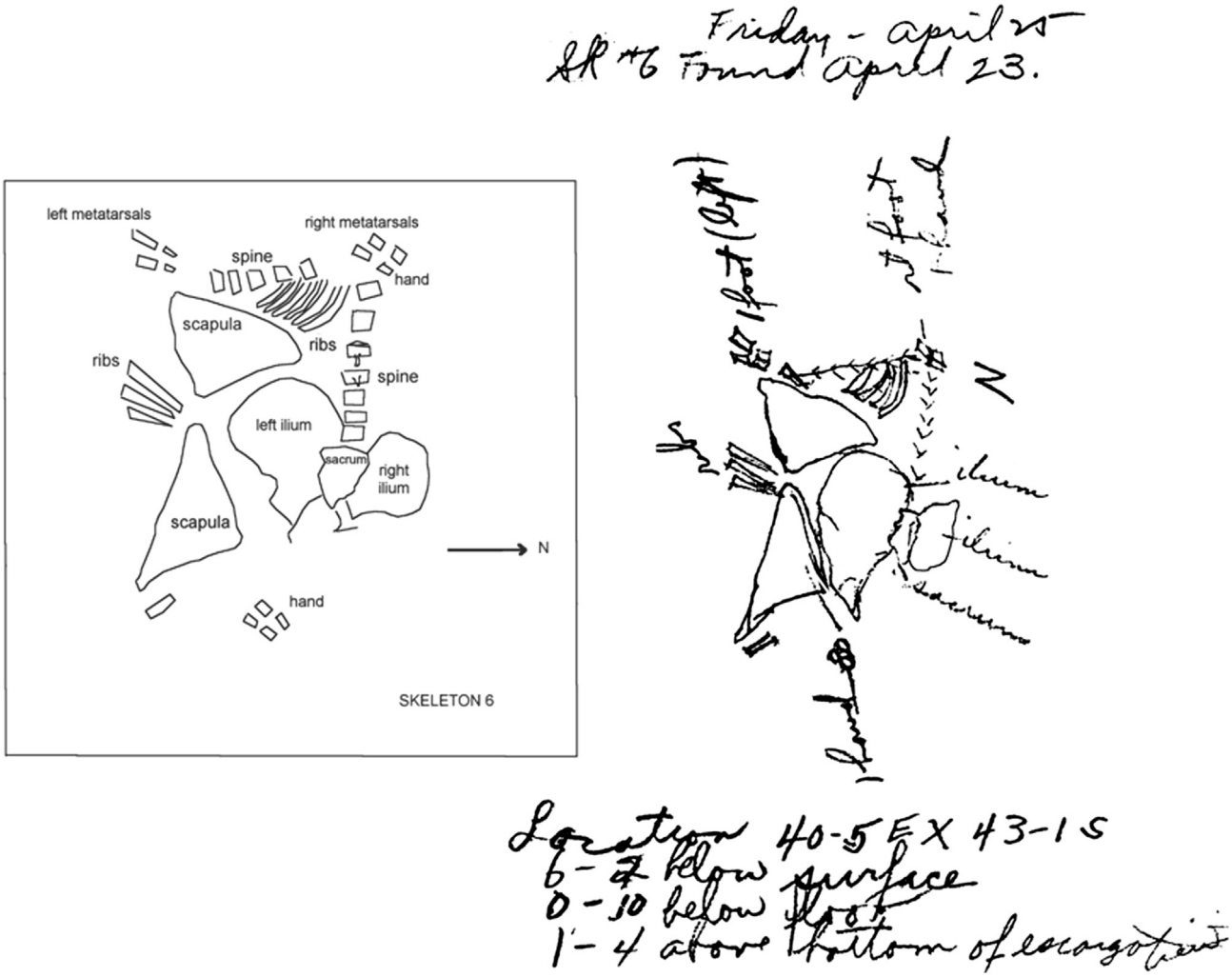

Fig. 11. Skeleton 3A-6: original sketch (Wilford, 1930a) with interpretation.

was within "a thick layer of shell with comparatively little dirt" that divided the middle level from the lowest level (Fig. 2a). Wilford (1930a, 16 May) says that "this skeleton was buried in the shell, and the dirt layer above it was unbroken, but the few inches above the skeleton was dirt instead of shell". The skeleton is characterized by trauma and bilateral but asymmetrical abnormalities of the feet which will be discussed elsewhere (Jackes et al., 2013b).

Unfortunately, the last two skeletons in the Minnesota trench (3A-7 and 3A-8) were found while Wilford was drawing his final profiles and there are no photographs or sketches of them. Wilford's (1930a, 16 May) description of 3A-7 allows us to understand the layout to some extent. He does not record that the body lay in ventral decubitus, but it must have been somewhat similar to 3A-1. There was, however, no skull and the tibiae and fibulae were missing. Ochre was distributed within the area of the skeleton.

The spine lay with the ochre-stained atlas to the east and the rest of the vertebrae stretched out to the west. Several lower lumbar vertebrae were, however, with the pelvis, detached from the rest of the spine. The pelvis was preserved as a unit, balanced on the ventral portion, about one foot [30 cm] to the north west of the lay beside the right femur, perhaps close to the pelvis. The scapulae were side-by-side under the left femur.

5.2.8. Skeleton 3A-8

Skeleton 3A-8, an infant with the femoral diaphyseal length of 81 mm, was 4 ft 11 in [1.5 m] below the surface and near 3A-7 (Fig. 2a), in the "middle level" surrounded by snail shells. Given the depth below surface, and the association with a shell layer, this skeleton must be prehistoric. It consisted of parts of vertebrae, long bones, pelvis and phalanges. The skull was missing and no red ochre was noted.

6. Skeletons excavated by the Beloit team

Table 1 lists the 24 skeletons excavated in the Minnesota trench and the Beloit Main Trench during the 1930 season: eight very well documented ones from the former and 16, much less well documented, from the latter. There were others for which there is no usable documentation (see below and discussions in Sections 1, 3 and 4).

Table 1
Skeletons from the 1930 Logan Museum and University of Minnesota excavations at Site 12.

Pond ID	Other ID	Photographs[a]	Source	Provenance	Description
1	–	64, 64a	Greenlee (1930, 8 March)	Main Trench	Skull cap face down
2	–	63, 63a	Brown (1930, 15 March)	Main Trench	Called "arab", considered intrusive, extended on right side with head facing SW
3	–	65?	Logan Museum catalogue	Main Trench?[b]	Fragmentary skull & jaws, flexed humerus, radius & ulna, ribs
4	–	65a?	Logan Museum catalogue	Main Trench?[b]	skull of small child; diaphyses of long bones beside face
5	–	105	WHS Pond album[c]	Main Trench	Adult skull, face down, on radius & ulna; fragmentary ribs, thoracic vertebrae, metatarsals
6	3A-1	106, 106a, 107, 107a, 108, 109	Wilford (1930b, 27 March)	Minnesota trench	See text; nb: skull beside pelvis
7	A	none identified	Williams (1930a, 27 March)	Main Trench	Skull fragment
8	B	110, 110a, b & c, 111	Williams (1930a, 28 March)	Main Trench	on left side, tightly flexed
9	C	111, 112, 416	Williams (1930a, 29 March)	Main Trench	child buried on stomach, skull disturbed by 11
10	D	none identified	Williams (1930a, 31 March)	Main Trench	Adult skull fragment (an unnumbered mandible fragment found the same day and the same level)
11	E	112, 416	Williams (1930a, 31 March)	Main Trench	Extended and lying on stomach, canted to the right; feet disturbed skull of 9
12	F	113, 113a	Williams (1930a, 29 March)	Main Trench	Extended on right side with legs laid ventral side down; head facing west on right side
13	3A-2	114	Wilford (1930a, 2 April)	Minnesota trench	See text; nb: skull beside pelvis
14	G	413?	Williams (1930a, 1 April)	Main Trench	Said to be intrusive, presumably extended, notes by Nash missing
15	H	none identified	Williams (1930a, 2 April)	Main Trench	Four vertebrae only
16	3A-3	UM-5215	Wilford (1930a, 4 April)	Minnesota trench	see text; nb: skull near pelvis
17	3A-4	115, 115a	Wilford (1930a, 5 April)	Minnesota trench	see text
18	J	116, 116a, 117, 117a & b	Williams (1930a, 10 April)	Main Trench	Exceptionally large adult, dorsal decubitus, knees raised and flexed, head to west, number of bone awls in association
19	K	118, 118b	Williams (1930a, 15 April)	Main Trench	Adult, originally lying on right side with legs strongly flexed; now disturbed with skull lying in pelvic basin
20	I	118a	Williams (1930a, 7 April)	Main Trench	Said to be intrusive, presumably extended
21	3A-5	401, 401a	Wilford (1930a, 17 April)	Minnesota trench	See text; nb: skull beside pelvis
–	3A-6	None identified	Wilford (1930a, 23 April)	Minnesota trench	See text; no skull
–	3A-7	None identified	Wilford (1930a, 16 May)	Minnesota trench	See text; no skull
–	3A-8	None identified	Wilford (1930a, 17 May)	Minnesota trench	See text; no skull

[a] All are from Logan Museum of Anthropology, Beloit College except for UM-5215 which is at Anthropology Laboratories, University of Minnesota.
[b] These two skeletons are identified only as being "found by Sharp and Gillin" who worked in both the Main Trench and Trench 2.
[c] The Wisconsin Historical Society has an album of photographs with captions by Alonzo and Dorothy Pond.

spine. The femoral heads were in the acetabuli, the right femur passing across the spine and the left lying north of the spine. The left humerus lay over the right femur at the point where it crossed the spine: the left radius and ulna lay beyond the pelvis. The right humerus was beneath the left femur, and the right forearm bones

We have been able to confirm the identifications of most of the photographs held by the Anthropology Laboratories at the University of Minnesota (UM), the Wisconsin Historical Society (WHS) and the Logan Museum (LM), and we use their identification numbers in the discussion that follows. The most extensive are in a

series numbered between LM 30-63 and LM 30-149a which includes most of the Beloit Main Trench skeletons and some from the Minnesota trench. Beloit Trench 2 material seems to be recorded in photos LM 30-404 to LM 30-408, but unfortunately, this does not give us a good coverage of the 14 burials found in that trench.

Two skeletons from Beloit Trench 2 (H and I) were extended lying on their right sides and others seem to have had an extended posture before disturbance. One child lay in dorsal decubitus with the flexed knees raised. There appear to be no photo records for the one burial found in Beloit Trench 3. In addition, a number of negatives show us something of the Site 10 skeletons, perhaps eight of them, two with skull only, one with the skull associated with some upper body fragments, one lying in ventral decubitus, one dorsal and only one in lateral decubitus, but we have no basis for further discussion. The Minnesota Trench skeletons are incompletely represented in negatives UM 5227–5362.

6.1. Burial dispositions

The fullest photographic representation is for the Beloit Main Trench and we will try to summarize the variations in burial posture based on these images, with the proviso that the bones are not available to us and that we have no more than a few rough notes on some of the skeletons.

The first human material found was an isolated skull cap. The second find was a complete skeleton, buried in an extended position and was immediately said to be intrusive, as were later similar finds. It is difficult to be certain that all skeletons lying on their right sides in an extended posture were intrusive. Certainly some lay close to the modern surface and some are very well preserved (photos LM 63, 118a and 413, this last perhaps Pond Skeleton 14 found only 20 cm below the surface). Pond Skeleton 20 (photo LM 118a) was 35 cm below the surface (Williams, 1930). The skeleton appears to be lying on the right side with an articulated vertebral column, pelvis, left arm and leg shown. In contrast, Skeleton 3A-4 was close to the surface, extended and mostly complete, but badly weathered. Beloit Trench 2 Skeletons H and I (photos LM 404, 405) lay extended on their right sides with very slightly flexed knees, are not well preserved but clearly lay at least a metre below the modern surface.

Besides the skeletons that were extended on their right sides, several appear to be in ventral decubitus but in fact they were laid out with the axial skeleton on the right, or tilted to the right, despite the fact that the legs are lying ventral surface down. This description applies to Beloit Main Trench skeletons 11 and 12. A child (Skeleton 9) at the feet of Skeleton 11, its skull apparently disturbed by the later burial of the adult, is described as fully ventral, and photo LM 112 appears to confirm this. Skeleton 12 may also have disturbed another burial as there were "extra bones". All these burials were regarded as "intrusive", although Williams recorded the depth of Skeleton 9 as 54 cm and Skeleton 12 as 115 cm. Further complicating the issue is the fact that next to Skeletons 9 and 11 there is another individual, said to be "*in situ*" rather than intrusive, also well preserved but in a different burial disposition. This is Skeleton 8 (LM 110, 110a, 110c and 111), lying on the left side with the knees strongly flexed, the left forearm propped straight up near the skull, the right arm folded across the body (Fig. 10). It is the only burial in this posture (3A-3 has more extreme flexion, and the skull repositioned).

A completely different type of knee flexion is seen with Skeleton 18 (photo LM 117) and Skeleton N, a child in Beloit Trench 2 (photo LM 408). Both of these are reminiscent of Skeleton 3A-5 in that they lie in dorsal decubitus with the knees raised and flexed. Skeleton 18 differs from the others, however: in this case the torso is lying flat rather than angled down into a depression. The right arm is thrown across the neck and lower face, a pattern not evident elsewhere. Williams (1930a) says this was an exceptionally large individual.

A last case of knee hyperflexion is seen in Skeleton 19. Photo LM 118b shows a pelvis with several lower lumbar vertebrae standing upright and a mandible on the ventral surface of the right iliac blade. The right knee is folded out in a kneeling position, similar to Skeleton 3A-1. This individual is also shown at an earlier stage of excavation in photo LM 118, with the skull on the pelvis, the two forearms near what must be the right knee, the hands by that knee, and the left knee also folded toward the right knee.

It is unfortunate that the notes on Skeleton 19 have been lost, but Williams (1930a) says both Skeleton 18 and Skeleton 19 were found "half flexed", nearly 2 m below the surface. Skeleton 19 provides a clear case of removal of the skull from its original position. It is unlikely that this skull could have rolled down the body to end up on the pelvis during the process of decomposition: the grave fill, heavily charged with whole and crushed shell can be clearly seen in the photographs, even within the mandible. Furthermore, the right humerus lies across the left side of the thoracic spine strongly suggesting that there was disarticulation. Indeed, the Beloit Main Trench provides us with other evidence of post-mortem manipulation of bodies – there are stray skulls, fragmentary mandibles and vertebrae. Photographs show that these were completely isolated and not the result of disturbance of one burial by another.

Photos LM 65 and 65a may record fragmentary human material found in Beloit Trench 2, and it is reasonable to assume that they record Pond Skeletons 3 and 4 which cannot be identified otherwise. Photo LM 65 shows a badly weathered adult skull, flexed forearm (left?) and ribs, suggesting a damaged extended burial: it is little more than a guess to say this is an extended lateral decubitus burial. But photographs of other burials suggest dispositions different from any so far described. In photo LM 65a, a child's skull lies on a folded (left?) arm, with the arm itself apparently lying over lower leg bones, possibly hyperflexed on the trunk. And finally, we have photo LM 105 which is labeled as Skeleton 5 (Beloit Main Trench). Here again we have a skull, part of an adult burial, apparently lying on the right forearm, but with no sign of the humerus. Below the skull is the atlas, with a fragment of clavicle and part of the mandibular ascending ramus also visible. Thoracic vertebrae and ribs are lying dispersed and generally in a different orientation from the skull, with scattered metatarsals beyond. This is an apparent ventral decubitus burial, much disturbed. Unfortunately, no description is available, so we do not know whether hyperflexed lower long bones were found as the excavation proceeded. It is not possible to be certain, but photo WHS 104a apparently shows the location of this skeleton in the Main Trench which could have lain at 1.4 m below the surface, judging from Pond et al. (1938, Fig. 3).

7. Burial mode

The 1930 excavation yielded a variety of burial modes. It is extremely difficult to know what the original mode was, except in the case of complete lateral decubitus skeletons which are no doubt undisturbed. What was the original placement of other bodies? Table 1 shows burials that have lateral, dorsal and ventral disposition with knees that are flexed up, flexed sideways to various degrees to extreme flexion, or flexed below the body in something like a kneeling mode. Skulls can be in a position normal for an articulated skeleton or misplaced, with a number of cases in which the skull is placed beside or in the pelvic basin. Skulls were also found completely separate from other bones.

Thus, not all bodies interred extended on the right side were equally well preserved: not all complete well-preserved skeletons

were in full extended lateral decubitus, some could have legs which were lying with the ventral surface down, or with varying degrees of flexion. Bodies which were obviously manipulated after being partially skeletonized might have lain initially in postures other than those found at excavation. While skeletons are variably complete, in only one case is there evidence for disruption of one burial by another (Beloit Main Trench Skeletons 11 and 9). The variability ranges all the way down to a few selected fragments which still included fragile hyoids and pubic symphyses.

There is some evidence for pit burials: Skeleton 3A-5 and Main Trench Skeletons 8 and 18, together with Beloit Trench 2 Skeleton N. For Skeleton N, we can only say that the disarticulations appear to be perfectly concordant with normal decompositional disarticulation, but the photograph needs checking against the actual bones. Skeleton 18 suggests constriction of the body only in the lower half, so that the right ilium maintains its position, the left ilium was probably also held in position, with the left femur almost upright. The tightly flexed right knee, with the right foot twisted in and placed at hip level, has fallen ~50° to the left. Skeleton 18 underwent a caudally constricted primary burial, with some post-decompositional movement of the upwardly flexed legs (to be expected, based on very similar burial dispositions in Portuguese Mesolithic shell middens (Jackes et al., 2013a,b)). Skeleton 8 is a different and very interesting burial, reminiscent of SHM-1 Sépulture 1 in Tunisia (Munoz et al., 2013) and Aïn Misteheyia H-1 (Meiklejohn et al., 1979). Some "effect of a wall" (Duday et al., 1990) is suggested by the maintenance of the right ilium, the right scapula and the left forearm in position. On the other hand, the right ribs have slumped into the space left by the decomposition of the organs and the bones of the right arm have moved in a manner entirely consistent with normal decompositional settling. We do not know how far below the surface this skeleton was found.

Besides the fact that depths below the surface do not mean very much in the case of a mound that was sloping both along and across the trench when coordinates are not given, there is a further uncertainty. Skeleton 8 was said to be in *in situ* and in the "first level". Unfortunately, the Main Trench levels are problematic. Initially the trench was excavated by arbitrary levels, but difficulties with keeping the deposits apart during screening led to the entire trench being excavated as "mixed levels". Eventually, excavation was undertaken in four arbitrary levels of 65 cm each but these begin well below surface. Based on the date of excavation, Skeleton 8 was probably in the first of these four lower levels.

To conclude: the Site 12 records do not allow us to specify the normal burial mode for Capsian dead. The data demonstrate that use of the site as a burial place continued for thousands of years, possibly into an almost undocumented post-Capsian period similar to Aïn Misteheyia H1 (Lubell et al., 2009), less than 100 km to the south. Only further research, both in the field and with existing collections (e.g. Aoudia-Chouakri, 2013) can resolve the uncertainties.

8. Radiocarbon dates and stable isotopes

Our attempts to extract collagen from 3A-3, 3A-5 and 3A-6 were unsuccessful, but we were able to analyze 3A-1, 3A-2 and 3A-7 (Table 2).

Table 2
Radiocarbon dates and stable isotopes for skeletons from Site 12 and Aïn Misteheyia.

Skeleton	Lab ID	Date bp	Cal BP 1 σ range	$\delta^{13}C$	$\delta^{15}N$	Atomic C:N
Site 12 3A-1				−19.80	6.32	3.44
Site 12 3A-2	TO-12195	7890 ± 100	8591–8973	−19.06	6.93	3.34
Site 12 3A-7	TO-12196	3090 ± 160	3069–3472	−23.99	9.02	3.10
AM H-1	TO-12194	4890 ± 80	5488–5726	−17.74	13.34	3.26

The date for a rib fragment labeled 3A-2 is consistent with two other conventional radiocarbon dates on charcoal from Beloit Trench 2 Level III (SMU-1132: 7330 ± 390 BP or 7753-8539 cal BP) and Level IV (SMU-1135: 7780 ± 250 BP or 8385-8979 cal BP).

The result for 3A-7 was not concordant. The collagen was extracted from a distal shaft fragment of the femur labeled 3A-7 and there is no reason to question the integrity of the sample. The skeleton was buried in a shell deposit below an unbroken dirt layer (Fig. 2a). The cutmarks (Haverkort and Lubell, 1999) and removal of the skull, tibiae and fibulae are entirely consistent with Capsian practices. This is reinforced by the fact that all bones of the feet remain and are well preserved (with bilateral anomalies), so that we have to assume that the tibiae and fibulae were removed, together with the skull, from an intact skeleton. Thus, although the date is far younger than any known Capsian occupation and completely out of synchrony with the dates for 3A-2 or Levels III and IV, we can only conclude this skeleton should be assigned to the Capsian on the basis of treatment of buried human bone.

The stable isotopes for 3A-2 are in accord with those for 3A-1. Although these values are different from 3A-7, the data base for other Capsian skeletons is minimal and does not allow us to evaluate a range. The logical comparison is with Skeleton H-1 from Aïn Misteheyia, but the values are very different and there are unresolved questions about this skeleton which, despite being in Capsian deposits dated to over 9000 cal BP, has two collagen dates of around 5000 cal BP (Lubell et al., 2009) – a situation similar to the date for 3A-7.

Data for three human skeletons from the Capsian site at Hergla in Tunisia (Mannino and Richards, 2013), suggest consumption primarily of terrestrial food sources, but this is a coastal site and thus we must be cautious. The values for $\delta^{13}C$ range from −16.8 to −14.5 and for $\delta^{15}N$ from 10.4 to 11.0 and are therefore rather different from those of the three Site 12 individuals, especially for $\delta^{15}N$, but not so markedly as from Aïn Misteheyia H-1.

There are, to our knowledge, no other comparable North African data. Stable isotope values for five individuals from three late Pleistocene-early Holocene sites on Sicily (Mannino et al., 2011) are interpreted as having a diet based primarily on terrestrial resources despite their proximity to the coast, and these are to some extent comparable to the Site 12 individuals.

9. Discussion

9.1. Post-mortem use and manipulation of human bone

While the skeletons often seem merely to be a jumble of bones, they have not just been disturbed and trampled or kicked. We assume that the bones were well buried and avoided any disturbance by scavengers such as jackals. There is no gnawing or tooth marking of any sort. Even Skeleton 3A-2, which is so fragmentary, includes parts that are uncommon to find complete in archaeological contexts (hyoid and ossified thyroid cartilage). All things considered, the bones are in surprisingly good condition. The alternative to Pond's insistence that the bodies were unburied is to consider the possibility that human bones were harvested for specific purposes.

Capsian groups routinely used human bone, obtained post-mortem, for both utilitarian and ritual/symbolic purposes (Camps-Fabrer, 1966, pp. 179–186, 1975, pp. 323–330). At Site 12, several skeletons were obviously disturbed after death, some bones removed, some placed in non-anatomical positions. There is one particularly curious feature, rarely encountered in mortuary archaeology – the placement of the skull with the pelvis – which seems to have occurred at least five times (Table 1). Interestingly, there appears to be a similar documented instance for Skeleton H4 at Medjez II (Camps-Fabrer, 1975, Fig. 136).

A "fabricator" made on a radius from the Beloit Main trench was illustrated by Pond et al. (1938, Plate 73, 32). He also illustrated an unrecognized fibula from Trench 2 (Pond et al., 1938, Plate 74, 23) which he described as having a worn but battered end.

Furthermore, there is an increasing body of evidence that manipulation of human remains was common amongst both Iberomaurusian (Ben-Ncer, 2004; Mariotti et al., 2009) and Capsian groups (Aoudia-Chouakri, 2009, 2013; Ben Moussa, 2001–2002; Munoz et al., 2011).

The material labeled as Skeleton 3A-2 contains fragments of another skeleton (Fig. 7b) but we do not see a consistent pattern of disturbance of earlier by later burials. We recognize that some damage may be due to excavation, as well as the long period from the 1930s to the 1970s during which the bones were curated under less than ideal conditions. But those factors cannot account for what we have observed. The only plausible explanation is disarticulation and replacement of bones, probably after a certain period of burial. The disarticulation is not, however, wholesale, such as is seen with the secondary burial characteristic of Huron ossuaries in Ontario (Jackes, 1996) where bodies were reburied following exposure or primary interment. Although not all cuts necessarily mark bone, it is obvious that complete disarticulation with purposeful mixing of separated bones was the objective of Huron burial practices. This cannot be true of the practices at Site 12 in which many bones remain either in articulation or in a fairly close relationship after decompositional movement. The patterns observed at Site 12 seem more like manipulation of bones after partial natural decomposition. Furthermore, the presence of articulated hands and feet argue against secondary burial, in the sense of relocating a skeleton some distance from the original burial site after extensive and intentional disarticulation.

9.1.1. Cutmarks

Information on cutmarks associated with secondary burials is limited, since details are rarely provided. Two theses on the pre-contact Poole-Rose Ossuary in Ontario provide useable data for a few skeletal elements. This allows us to discover, for example, that 16% of the distal half of femora have cutmarks (Schiess, 2002) and that 16% of clavicles have cutmarks (with 44% of those having over 20 cuts per bone) (Smith, 2010). We might assume then, that, around 16% of the primary burials required extensive processing before they could be disarticulated, bundled, and thrown into the ossuary pit (those recently dead would simply be laid into the bottom of the pit, fully articulated (Jackes, 1977)).

The later Huron site of Ossossané (with the burial ceremony probably ethnohistorically documented to 1636, the bones now reburied) had around 681 individuals placed in one large ossuary pit, including perhaps 500 adults (Jackes, 1994, p. 180). The long bones with cutmarks were examined by Jones (1979). Of the adult bones with cutmarks, 36% were humeri and 37.5% of the total cuts observed were on humeri. The cuts were positioned on the proximal, shaft and distal portions of the humeri with no statistically significant difference due to position. The next highest total for the number of cutmarks was for the femora (20%), 76% of those cuts being on the proximal portion. Tibiae came next (17.6%), with the cutmarks unexpectedly most common on the shafts, perhaps reflecting poor preservation of the proximal portion. The difference between the number of tibia and of femora with cutmarks was not significant. It is interesting that in fact only 61 humeri had cutmarks. Since poor preservation does not allow accurate recording of all portions of all bones, no more than about 75% of adult humeri might be represented in an excavated sample. This figure is based on a careful study by Rost (1999) of the Buckingham Ossuary where it is relevant that the olecranon fossa was the most often preserved portion of the humerus, less commonly cut than areas on and above the epicondyles. On the basis of the preservation data presented by Rost, we can estimate that at least 16% of adult humeri might have borne cutmarks at Ossossané.

Russell (1987) provides data from the earlier Juntenen Site in Michigan which allows us to understand that – as could be expected – different bones require different degrees of processing, so that while 60% of clavicles have cutmarks, only 36% of femora were similarly treated (and only 8% of fibulae). Raemsch (1993) gives us a good overview of dismemberment for the earlier Rivière aux Vase site, also in Michigan. By contrast, here only 0.6% of clavicles were cut and the most common region, apart from the mandible, was the proximal femur (6%). The nature of the multiple burial practice is an important consideration. Extensive reburial of skeletons may require different degrees of manipulation: large scale pits containing separated and mixed bones could well involve more processing than careful arrangements of bundled long bones (Jackes, 1988) because more effort would be required to free joints of clinging tissues which could be ignored in bundling. The exact details of the primary treatment (burial or exposure) as well as length of time since death would also alter the qualities of the remaining soft tissues. Ossuary reburials took place when villages were relocated, an important consideration being the proximity of land not yet exhausted by the horticultural practices. Time between burial ceremonies could be variable.

A specific comparison is possible between the cutmarks on the first two cervical vertebrae in Site 12, on 3A-2, 5 and 6, and probably on 3A-1, and the distribution of cutmarks on vertebrae at the late pre-Contact Huron ossuary at Kleinburg in Ontario (Jackes, 1977). The ten cervical cutmarks at Kleinburg were in C3 to C5, some deep enough to divide the neural arches. Thoracic vertebrae had 15 and the lumbar vertebrae had eight cutmarks, only one on an L5. The process of skeletonisation at Kleinburg was obviously different from that in the Minnesota Trench, with decapitation rather than defleshing a primary aim at Site 12. What seems most evident from the comparison between secondary burials such as practiced in the northeastern area of North America and the manipulation to be seen in the Minnesota trench at Site 12, is the difference in scale. All the adults excavated from the trench, except for 3A-4, had missing long bones and/or missing or displaced skulls, and/or cutmarks.

What is clear is that post-mortem manipulation of bone will have varied outcomes. Some skeletal elements (such as the left humerus of Skeleton 3A-1) could apparently swing with loose ligamentous attachments remaining; others will remain in unstable situations (Skeleton 3A-1 left scapula, ribs and vertebrae) requiring that we consider support from stones, bones and heavy hearth deposits charged with charcoal and shell; others will need the use of cutting implements, for example the removal of the skull of Skeleton 3A-1, which led to cutmarks on the mandible and probably also on the lost axis; because parts of skeletons have their own microclimates, there can be bilateral differences, as with the elbows of Skeleton 3A-1 in which the right humerus, ulna and radius were completely disarticulated without needing cutting that reached the bone, whereas the left elbow was marked by cuts and the left radius and ulna retained their connection.

The variability is a clue that the manipulation or processing of the skeletons probably occurred with a delay after death, that there was a primary burial followed – in some cases – by one or more episodes of intervention, sometimes involving removal of selected bones. It is difficult for us to envision repeated post-mortem manipulation of a cadaver in the context of the use of human bone for tools, but it is entirely possible that human bones were harvested in a patterned respectful manner. For example, Wilford (1930a) appears to suggest that the greatest amount of red ochre was associated with Skeleton 3A-2, much more than with the more intact skeletons: perhaps the more bones removed, the more red

ochre was added. As further evidence of patterning, we can note the consistent placement of the skull in or near the pelvis. Finally, the frontals of both Skeletons 3A-1 and 3A-2 are damaged, and a smooth oval stone lay under the skull of 3A-1 (photographs seem to show added stones behind the ascending ramus to keep the teeth in occlusion). An additional observation is that while Skeleton 3A-1 is female, 3A-5 and 3A-2 are probably male and female respectively. Despite the patterning, there appears to be no selection by gender.

10. By way of conclusion

Given the many problematic aspects of the available data discussed here, it is difficult to come to any firm conclusions. A major question remains – were all the skeletons excavated at Site 12 (and by implication at many other Capsian escargotières) actually Capsian? How much variability in mortuary practices was there and over what span of time?

Pond interpreted all extended burials and any found near the surface as "intrusive", by which he meant later than the Capsian occupations at the sites. In his opinion this was definitely the case at Site 25 where 11 skeletons were found "which did not belong to the escargotière deposit as they were in material washed down from the higher parts of the mound" (Pond et al., 1938, p. 135). Greenlee's (1930, 25 April to 22 May) excavation notes are less categorical. Although Pond implies that all 11 were complete, adult and extended, Greenlee, who was not an inexperienced Beloit undergraduate, refers to both incomplete and juvenile skeletons. It does not seem possible to interpret all the Site 12 extended burials as being in "material washed down from higher parts of the mound". Williams (1930a) notes that Beloit Main Trench Skeletons 9 and 12 were in fill or deposit which "leads one to believe that the burial was intrusive" and yet the latter was found the same day as Skeleton 10 at the same depth and described as "certainly *in situ*". Only the missing notes and essays of the students, if sufficiently detailed, could tell us whether they actually observed signs of pits dug through midden deposits (although such signs may be erased by deflation and compaction). While Wilford did discuss the nature of materials above a skeleton, the only comments Williams provides are that Skeleton 11 had a large rock 10 cm above the skull and Skeleton 18 was found under "a large band of shells" and in association with a number of bone awls. Skeleton 19 was "in much the same position", an unfortunately ambiguous description. But as noted above, Skeleton 19 was clearly surrounded by hearth deposit.

Camps-Fabrer (1975, pp. 301 ff.) discusses the complexity of, and variability in, Capsian mortuary patterns and shows that there are many different patterns, often in the same site and with no clear preference for one over another. She argues that "… on a trop systématiquement éliminé les squelettes inhumés dans les escargotières quand ils se trouvaient en position allongée, à une faible profondeur, ou dépourvus d'avulsion dentaire" and "on ne doit pas pour autant rejeter comme récent un squelette qui n'est pas en position repliée… non plus systématiquement suspecter les inhumations apparues à une faible profondeur" (1975, pp. 319–320).

She goes on to say (Camps-Fabrer, 1975, p. 317) that the absence of any visible traces of burial "monuments", suggests Capsian groups may have "enseveli leur morts sous les huttes de branchages qui devaient leur servir d'abri". Given the absence of marks of scavenging or weathering, this is unlikely unless the shelters were very substantial and there is no evidence for that. As we have already stated when discussing Skeleton 3A-1, at Site 12 we do not find evidence for anything other than direct burial and later reopening of graves.

Balout (1955, p. 13) noted the problem of later use of Capsian sites as cemeteries and the difficulty of attributing burials to a particular period.

> On n'a pas cru devoir rejeter à la fin de l'Inventaire les documents d'ancienneté douteuse: il y a peu d'années, on y eût placé tous les restes humains n'appartenant pas à la race de Mechta el-Arbi qui avaient été exhumés de gisements préhistoriques, et que l'on eût considérés comme «récents». Certes, nos escargotières ont pu servir de cimetières au cours des temps historiques, et, par exemple dans la région de Tébessa, encore au cours de la famine de 1884; mais notre connaissance de l'humanité capsienne est encore trop imprécise et fragmentaire; ses relations anthropologiques avec les Berbères sont si probables, qu'une révision des squelettes qualifiés par les fouilleurs de «récents» s'impose, et n'a pas toujours été décisive, ou simplement possible.

There are clear problems of intra-site chronology. Site 12 is not unique in having marked differences in the radiometric dates for skeletons found in the same site. At Aïn Misteheyia, less than 100 km to the south, a tightly flexed adult skeleton found deep within deposits dated older than 9500 cal BP and with no observable evidence for burial from upper layers, has been directly dated by two laboratories to ~5500 cal BP (Table 2), a period we have to consider as post-Capsian (Lubell et al., 2009).

This raises the question of how long escargotières were used as places of prehistoric burial and whether or not there is long-term continuity. Aoudia-Chouakri (2013) argues that an identical, occasional, technique, found in both Iberomaurusian and Capsian burials, involved dismemberment (decapitation, dislocation, defleshing and evisceration) and burial in dislocated anatomical blocks and that the skull, after flaying, was sometimes decorated, even with modeling.

Thus, given the evidence provided by direct dating (of which we clearly need more), it would appear that there *was* long-term continuity, extending into a post-Capsian period, in both practices and places of burial, and that what we have reconstructed for Site 12 is part of this pattern.

Acknowledgements

The Beloit records, the correspondence and diaries of the student participants and the cinema films made by Pond and Jenks which are now conserved at the Smithsonian, have been salvaged and archived largely through the efforts of Michael Tarabulski (see introduction in Breitborde 1992; Green et al., 2013) to whom we are enormously grateful. The Minnesota archives have been recorded and salvaged through the efforts of the late Elden Johnson and John Soderberg.

Many photographs from the 1930 expedition in the Logan Museum have been digitized and are available at http://dcms.beloit.edu/cdm/search/collection/african/ and use the search term "skeleton".

Collagen extractions used for the radiocarbon dates were done by Sandra Garvie-Lok, Anthropology, University of Alberta.

Thanks to Kathleen Scheaffer, Librarian, Faculty of Information, University of Toronto and especially to Barbara Jones for her help in accessing data on Huron cutmarks.

We thank the two anonymous reviewers for their questions and suggestions which have improved this paper.

References

Anonymous, 1930a. Archeological field work of the University of Minnesota in 1930. Science 72 (1877), 622–623.

Anonymous, 1930b. Skeletal Remains of the Mechta Race in the Archaeological Museum of the University of Minnesota. In: MS on File and Laboratories of Anthropology. University of Minnesota.

Anonymous, 1935. Measurement of North African Skeletal Material. In: MS on File and Laboratories of Anthropology. University of Minnesota.

Anyon, R., LeBlanc, S. (Eds.), 1984. The Galaz Ruin: a Prehistoric Mimbres Village in Southwestern New Mexico. Maxwell Museum of Anthropology and the University of New Mexico Press, Albuquerque.
Aoudia-Chouakri, L., 2009. Le crâne modifié de Faïd Souar II: chirurgie compensatrice ou rituel? Culture capsienne, Algérie-Tunisie: Xème-Vème millénaire avant J.-C. In: Delattre, V., Sallem, R. (Eds.), Décrypter la différence: lecture archéologique et historique de la place des personnes handicapées dans les communautés du passé. CQFD, Paris, pp. 31–32.
Aoudia-Chouakri, L., 2013. Pratiques Funeraires Complexes: Reevaluation Archeoanthropologique des Contextes Iberomaurusiens et Capsiens (Paleolithique Superieur et Epipaleolithique, Afrique du Nord-ouest) (Ph.D. thesis). Université Bordeaux 1, PACEA UMR 5199, Équipe A3P École doctorale Sciences et Environnements, France (Abstract).
Balout, L., 1955. Les Hommes Prehistoriques du Maghreb et du Sahara. Service des Antiquités, Alger.
Ben Moussa, S., 2001–2002. Les Rites Funéraires Capsiens. Mémoire en vue de l'obtention d'un D.E.A en Préhistoire. Université de Provence, UFR Civilisations et Humanités, UMR 6636 Économies, Sociétés et Environnements Préhistoriques.
Ben-Ncer, A., 2004. Étude de la sépulture ibéromaurusienne 1 d'Ifri n'Baroud (Rif oriental, Maroc). Antropo 7, 177–185. www.didac.ehu.es/antropo.
Breitborde, L. (Ed.), 1992. Alonzo Pond and the 1930 Logan Museum Expedition to North Africa: the 1985 Beloit College Symposium. Logan Museum Bulletin (New Series), vol. 1(1). Logan Museum, Beloit College, Beloit.
Brown, R., 1930. Field notes. In: Typescript on File and Laboratories of Anthropology. University of Minnesota.
Camps-Fabrer, H., 1966. Matière et Art Mobilier dans la Préhistoire Nord-Africaine et Saharienne. Mémoires du Centre de Recherches Anthropologiques, Alger. Préhistoriques et Ethnographiques No 5.
Camps-Fabrer, H., 1975. Un Gisement Capsien de Faciès Sétifien: Medjez II, El-Eulma (Algérie). Centre National de la Recherche Scientifique, Paris.
Duday, H., Courtaud, P., Crubézy, E., Sellier, P., Tillier, A.M., 1990. L'anthropologie de "terrain": reconnaissance et interpretation des gestes funéraires. Bulletin et Mémoires de la Société d'Anthropologie de Paris, NS 2 (3–4), 29–50.
Gobert, E.-G., 1937. Les escargotières: le mot et la chose. Revue Africaine 81, 639–645.
Green, W., Mutri, G., Thompson, W., 2013. North African archaeological collections at the Logan Museum of anthropology: overview and research potential. Quaternary International 320, 75–82.
Greenlee, R., 1930. Diary. In: MS on File and Logan Museum of Anthropology. Beloit College.
Haverkort, C.M., Lubell, D., 1999. Cutmarks on Capsian human remains: implications for Maghreb Holocene social organization and palaeoeconomy. International Journal of Osteoarchaeology 9 (3), 147–169.
Humphrey, L.T., Bocaege, E., 2008. Tooth avulsion in the Maghreb: chronological and geographical patterns. African Archaeological Review 25 (1–2), 109–123.
Institut Géographique National, 1950. Carte d'Algérie au 50.000e (Type 1922), Jean Rigal, Feuille No. 123_B7_C29. Ministère des Travaux Publics et des Transports, Paris.
Jackes, M., 1977. The Huron Spine: a Study Based on the Kleinburg Ossuary Vertebrae (PhD dissertation). Department of Anthropology, University of Toronto.
Jackes, M., 1988. The Osteology of the Grimsby Site. Department of Anthropology, University of Alberta.
Jackes, M., 1994. Birth rates and bones. In: Herring, A., Chan, L. (Eds.), Strength in Diversity: a Reader in Physical Anthropology. Canadian Scholar's Press, Toronto, pp. 155–185.
Jackes, M., 1996. Complexity in seventeenth century southern Ontario burial practices. In: Meyer, D.A., Dawson, P.C., Hanna, D.T. (Eds.), Debating Complexity: Proceedings of the 26th Annual Chacmool Conference: 127–140. Calgary, Archaeological Association, University of Calgary.
Jackes, M., Lubell, D., 2008. Environmental and cultural change in the early and mid Holocene: evidence from the Télidjène Basin, Algeria. African Archaeological Review 25 (1–2), 41–55.
Jackes, M., Alvim, P., Roksandic, M., Anacleto, J.A., 2013a. New photographic evidence on the 1954 excavations at Moita do Sebastião. In: Roksandic, M., Mendonca de Souza, S.M.F., Eggers, S., Burchell, M., Klokler, D. (Eds.), The Cultural Dynamics of Shell Middens and Shell Mounds: a Worldwide Perspective. University of New Mexico, Albuquerque (in press).
Jackes, M., Alvim, P., Cunha, M.J., 2011. Reconstructing Cabeço da Amoreira, 1930-1933. In: Proceedings of MESO 2010, Santander (in press).
Jackes, M., Parent, M., Lubell, D., 2013b. The Identification of Multiple Abnormalities in the Feet of One Individual from a Capsian Site in Algeria (Tentative) (in preparation).
Johnson, E., 1992. A.E. Jenks and the University of Minnesota Algerian Excavations. In: Logan Museum Bulletin (New Series), vol. 1(1), pp. 45–48.
Jones, B.D., 1979. An Examination of Cutmarks on Human and Faunal Bones from the Ososssané Ossuary (Unpublished MA thesis). Museum Studies Program, University of Toronto.
Lubell, D., 1992. Following Alonzo's Trail: Paleoeconomic Research in Algeria Since 1930. In: Logan Museum Bulletin (New Series), vol. 1(1), pp. 49–57.
Lubell, D., Ballais, J.-L., Gautier, A., Hassan, F.A., Close, A., Chippindale, C., Elmendorf, J., Aumassip, G., 1975. Prehistoric cultural ecology of Capsian escargotières I: preliminary results of an interdisciplinary investigation in the Chéria Télidjène region 1972-73. Libyca 23, 44–121.
Lubell, D., Gautier, A., Leventhal, E.T., Thompson, M., Schwarcz, H.P., Skinner, M., 1982-1983. Prehistoric cultural ecology of Capsian escargotières II: report on investigations conducted during 1976 in the Bahiret Télidjène, Tébessa Wilaya, Algeria. Libyca 30/31, 59–142.
Lubell, D., Sheppard, P., Jackes, M., 1984. Continuity in the epipalaeolithic of northern Africa with an emphasis on the Maghreb. In: Wendorf, F., Close, A. (Eds.), Advances in World Archaeology, vol. 3. Academic Press, New York, pp. 143–191.
Lubell, D., Feathers, J., Schwenninger, J.-L., 2009. Post-Capsian settlement in the eastern Maghreb: implications of a revised chronological assessment for the adult burial at Aïn Misteheyia. Journal of African Archaeology 7 (2), 175–189.
Lubell, D., Hassan, F.A., Gautier, A., Ballais, J.-L., 1976. The Capsian escargotières. Science 191, 910–920.
Mannino, M.A., Thomas, K.D., Leng, M.J., Di Salvo, R., Richards, M.P., 2011. Stuck to the shore? Investigating prehistoric hunter-gatherer subsistence, mobility and territoriality in a Mediterranean coastal landscape through isotope analyses on marine mollusk shell carbonates and human bone collagen. Quaternary International 244, 88–104.
Mannino, M.A., Richards, M.P., 2013. Analisi degli isotopi stabili di carbonio ed azoto sul collagene osseo dai resti scheletrici umani e faunistici di SHM-1 (Tunisia). In: Mulazzani, S. (Ed.), Le capsien de Hergla (Tunisie). Culture, environnement et économie, Reports in African Archaeology. Africa Magna Verlag, Frankfurt, pp. 315–319.
Mariotti, V., Bonfiglioli, B., Facchini, F., Condemi, S., Belcastro, M.G., 2009. Funerary practices of the Iberomaurusian population of Taforalt (Tafoughalt; Morocco, 11–12,000 BP): new hypotheses based on a grave by grave skeletal inventory and evidence of deliberate human modification of the remains. Journal of Human Evolution 56, 340–354.
Meiklejohn, D., Pardoe, C., Lubell, D., 1979. The adult skeleton from the Capsian site of Aïn Misteheyia, Algeria. Journal of Human Evolution 8, 411–426.
Merzoug, S., 2013. A level prior to the Upper Capsian at Medjez II (Algeria): archaeozoological and taphonomical evidences combined with archaeological data. Quaternary International 320, 125–130.
Mulazzani, S., Cavulli, F., Azzarà, V., Scaruffi, S., Boussoffara, R., 2009. Structures d'habitat Nord-Africaines: la fouille de la rammadiya cotière Holocène de Shm-1 (Hergla, Tunisie). In: Cavulli, F. (Ed.), Defining a Methodological Approach to Interpret Structural Evidence, Oxford, British Archaeological Reports, International Series 2045, pp. 31–42.
Munoz, O., Mulazzani, S., Roudesli-Chebbi, S., Candilio, F., 2011. Pratiques funéraires et données biologiques pendant l'Holocène en Tunisie. Le cas de SHM-1 (Hergla, Tunisie orientale). In: Hachi, S. (Ed.), Actes du Colloque International de Préhistoire maghrébine, Première Édition, 05-07 novembre 2007 Tamanrasset, Tome I, Alger, Travaux du Centre National de Recherches Préhistoriques, Anthropologiques et Historiques, Nouvelle Serie No 11, pp. 313–332.
Munoz, O., Candilio, F., Roudesli-Chebbi, S., 2013. Les restes humains de SHM-1 (campagnes 2002-2007): étude archéo-anthropologique. In: Mulazzani, S. (Ed.), Le capsien de Hergla (Tunisie). Culture, environnement et économie, Reports in African Archaeology. Africa Magna Verlag, Frankfurt, pp. 299–314.
Péquart, Cl, 2007. Des crânes sous la tempête, 7 ans de fouilles dans les îles bretonnes. In: Melvan, La revue des deux îles 4 (numéro spécial), pp. 61–148.
Pond, A.W., 1931. Suggestions on technique in archaeology. The Wisconsin Archaeologist New Series 10 (2), 45–53.
Pond, A.W., Romer, A.S., Cole, F.-C., 1928. A Contribution to the Study of Prehistoric Man in Algeria, North Africa. In: Logan Museum Bulletin, vol. 1(2). Logan Museum, Beloit College.
Pond, A.W., Chapuis, L., Romer, A.S., Baker, F.C., 1938. Prehistoric Habitation Sites in the Sahara and North Africa. In: Logan Museum Bulletin, vol. 5. Logan Museum, Beloit College.
Pond, D.L., 2013. If Women Have Courage: Among Shepherds, Sheiks, and Scientists in Algeria. Africa Magna Verlag, Frankfurt (in press).
Raemsch, C.A., 1993. Mechanical procedures involved in bone dismemberment and defleshing in prehistoric Michigan. Midcontinental Journal of Archaeology 18, 217–244.
Rahmani, N., 2004. Technological and cultural change among the last hunter-gatherers of the Maghreb: the Capsian (10,000 B.P. to 6000 B.P. Journal of World Prehistory 18 (1), 57–105.
Roberts, E., 1930. Diary. In: Typescript on File and Logan Museum of Anthropology. Beloit College.
Rost, R., 1999. A Bioarchaeological Approach to Constructing the Buckingham Ossuary Site (BcHb-24) Mortuary Practices (Unpublished MA thesis). Department of Anthropology, Peterborough, Ontario (Trent University).
Russell, M.D., 1987. Mortuary practices at the Krapina Neandertal site. American Journal of Physical Anthropology 72, 381–397.
Schiess, L.K., 2002. Evidence of Postmortem Cultural Modification of the Femora of the Poole-rose Ossuary as Part of the Feast of the Dead Ceremony (Unpublished MA thesis). Department of Geography and Anthropology, Baton Rouge (Louisiana State University and Agricultural and Mechanical College).
Sheppard, P., 1987. The Capsian of North Africa: Stylistic Variation in Stone Tool Assemblages. In: Oxford, British Archaeological Reports, International Series 353.
Sheppard, P., 1992. Snail Shells and Paradigms: the Role of the Logan Museum Expedition in North African Prehistory. In: Logan Museum Bulletin (New Series), vol. 1(1), pp. 33–44.
Smith, N.E., 2010. Demography, Health Status, and Mortuary Rituals of the Late Woodland Poole-rose Ossuary, Ontario, Canada: a Study of the Clavicles

(Unpublished MA thesis). Department of Geography and Anthropology, Baton Rouge (Louisiana State University and Agricultural and Mechanical College).
Tax, S., 1930. Letters. In: Typescript on File and Logan Museum of Anthropology. Beloit College.
Vaufrey, R., 1955. Préhistoire de l'Afrique. Tome 1 le Maghreb. Publication de l'Institut des Hautes Études de Tunis IV, Paris, Masson.
Voight, R., 1930a. Algerian Allegations. The Round Table (16 April 1930): LXXV (47), 1.
Voight, R., 1930b. Algerian Allegations. The Round Table (12 April 1930): LXXV (46), 1.
Voight, R., 1930c. Algerian Allegations. The Round Table (7 May 1930): LXXV (53), 1.
Voight, R., 1930d. Algerian Allegations. The Round Table (21 May 1930): LXXV (5?), 1.
Wilford, L., 1930a. Field Notes. In: MS on File and Laboratories of Anthropology. University of Minnesota.
Wilford, L., 1930b. Diary. In: MS on File and Laboratories of Anthropology. University of Minnesota.
Williams, K., 1930a. Report – Main Trench of Site 12. In: Typescript on File and Logan Museum of Anthropology. Beloit College.
Williams, K., 1930b. Diary. In: Typescript on File and Logan Museum of Anthropology. Beloit College.