Human Burial Evidence from Hattab II Cave and the Question of Continuity in Late Pleistocene–Holocene Mortuary Practices in Northwest Africa

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Archaeological excavations in 2002–3 at Hattab II Cave in northwestern Morocco revealed an undisturbed Late Palaeolithic Iberomaurusian human burial. This is the first Iberomaurusian inhumation discovered in the region. The skeleton is probably that of a male aged between 25 and 30 years. The individual shows a characteristic absence of the central upper incisors reported in other Iberomaurusian burials. Accompanying the burial are a stone core and a number of grave goods including bone points, a marine gastropod and a gazelle horn core. Thermoluminescence dating of a burnt stone artefact in association with the burial has provided an age of 8900±1100 BP*. This is one of the youngest ages reported for the Iberomaurusian and raises questions about persistence of hunter-gatherer societies in the Maghreb and the potential for continuity in burial practices with the earliest Neolithic.*

Human mortuary activity is well attested in the archaeological record of Late Pleistocene northwest Africa. Burials are known from various locations in the Maghreb region where they appear to be part of a cultural tradition that began in the Late Palaeolithic Iberomaurusian (Lubell 2001). Sites with collective burials include those in central and western Algeria, such as Afalou Bou Rhummel Cave (Arambourg *et al.* 1934; Hachi 1996; 2003) and most notably in eastern Morocco at Grotte des Pigeons, Taforalt, where two zones in the cave produced a reported number of over 180 human individuals (Ferembach *et al.* 1962; Roche 1963). To these can be added lesser sites such as Ifri n'Ammar, close to Taforalt, in which a sepulchre of four closely spaced burials was recently excavated (Mikdad *et al.* 2002; Moser 2003). Examples of single burials in the Iberomaurusian are, in contrast, relatively rare but they do include an adult burial from Ifri el-Baroud (Ben-Ncer 2004) as well as an isolated skull from Taza, Algeria (Meier *et al.* 2003), and a new discovery from Hattab II in northern Morocco reported in this article.

The method of interment in the Iberomaurusian appears to have varied widely from site to site and even within cemeteries. In some cases, the bodies were flexed and carefully placed in pits (e.g. Grotte des Pigeons, Taforalt) whereas in others the corpses were extended or were dismembered prior to burial and the bones scattered or deliberately placed in ossuaries, as at Afalou Bou Rhummel (Arambourg *et al.* 1934, 19–23). Despite the apparent diversity in mortuary behaviour, one of the most visible characteristics of the buried humans is the absence of one or more teeth in the anterior dentition of the jaw, particularly affecting the upper central incisors. Where such material has been studied in detail, it is clear that the front teeth were deliberately extracted during the lifetime of the individual, a practice referred to as dental ablation (Tayles 1990) or evulsion.

The dating of the Late Palaeolithic Iberomaurusian has been dealt with in several recent reviews and it is now believed unlikely to be much older than about 18,000 years BP, at least in Morocco (Barton *et al.* 2005; 2007; Bouzouggar *et al.* 2006; in press).

Cambridge Archaeological Journal 18:2, 195–214
doi:10.1017/S0959774308000255 Printed in the United Kingdom.

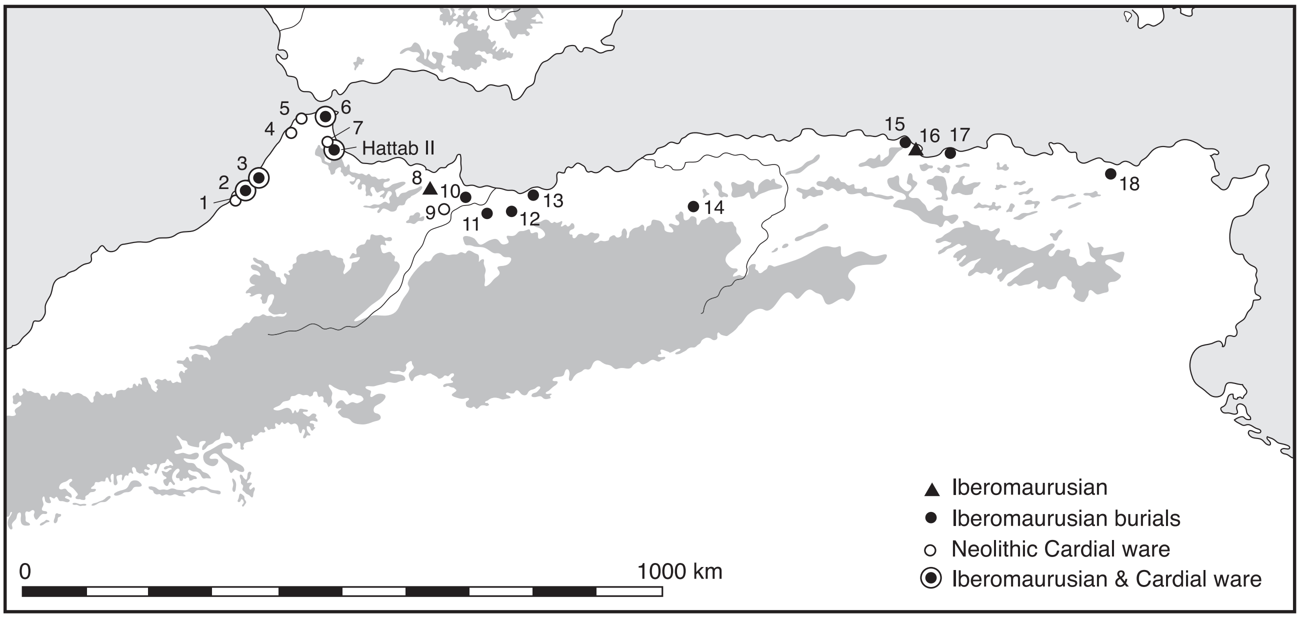

Figure 1. *Hattab II and other sites mentioned in the text. 1: Rouazi-skhirat; 2: Contrebandiers; 3: Harhoura II (Zouhra); 4: Wadi Tahadart; 5: El Khil; 6: Ghar Cahal; 7: Kaf That el Gar; 8: Ifri n'Baroud; 9: Hassi Ouenzga; 10: Ifri n'Ammar; 11: Taforalt; 12: La Mouillah; 13: Rachgoun; 14: Columnata; 15: Afalou; 16: Tamar Hat; 17: Taza; 18: Kef oum Touiza; 19: El Khenzira.*

Evidence for burial is surprisingly sparse for the earlier Iberomaurusian. A human cranium has been reported from Taza, potentially dating to 16,100±1400 BP (Meier *et al.* 2003). However, the isolated nature of the find and another date on charcoal of 13,800±130 BP, supposedly from the same layer, makes it difficult to determine whether the skull was in a primary context or intentionally buried. Much less problematic are the clearly *in situ* burials recorded in Couche 6 at Afalou Bou Rhummel, where the depositional sequence is bracketed by radiocarbon determinations of 11,450±230 BP (Ly-3227) for Couche III and 14,910±180 BP (Gif-9637) for Couche VII (Hachi *et al*. 2002). Newly resumed excavations by our team at Grotte des Pigeons now indicate that the human burials in the grey ashy deposits can be no earlier than charcoal with an AMS age of 12,675±50 BP from the base of this sequence. The dating of the burials at Taforalt is therefore likely to overlap with those from Ifri n'Ammar where the oldest direct determination on human bone is 12,290±133 BP (Erl-4401; Moser 2003).

The dating of the younger end of the Iberomaurusian is much less certain. Amongst the most recent ages for this industry in Morocco are those published for Grotte des Pigeons, where a determination on a single piece of charcoal in the topmost layers has provided an age of 10,935±40 BP (OxA-13479; Barton *et al.* 2007). Further to the north, artefacts, presumed to be Iberomaurusian, have been recorded in a layer dating to 9470±55 BP (OxA-11321) at Ghar Cahal (Bouzouggar *et al.* in press). A similar age of 9677±60 BP has been reported from near the top of the Iberomaurusian sequence at Ifri el-Baroud in eastern Morocco (Moser 2003, 100).

In March 2002, a series of previously unexplored caves were investigated by our team during a cave survey of the Tingitane and Talembote regions. In one of them, Hattab II, a fully intact human burial came to light. The well-preserved nature of the human skeleton and its position in a sealed context provided a unique opportunity for scientific study. The presence of accompanying grave goods and Iberomaurusian artefacts also offered a rare insight into burial practices in an area previously unknown for Iberomaurusian human burials.

Location and physical setting

Hattab II Cave (Fig. 1) is in the upland Rif region of northern Morocco (GPS 5°4'60"W, 35°26'26"N). The site lies at the northern end of a deeply incised gorge of the Ouled Ali Mansour, about 2.5 km from where it meets the main southwest–northeast valley of the River Laou. The latter is a major river that runs into the Mediterranean Sea some 10 km further northeast, near Oued Laou.

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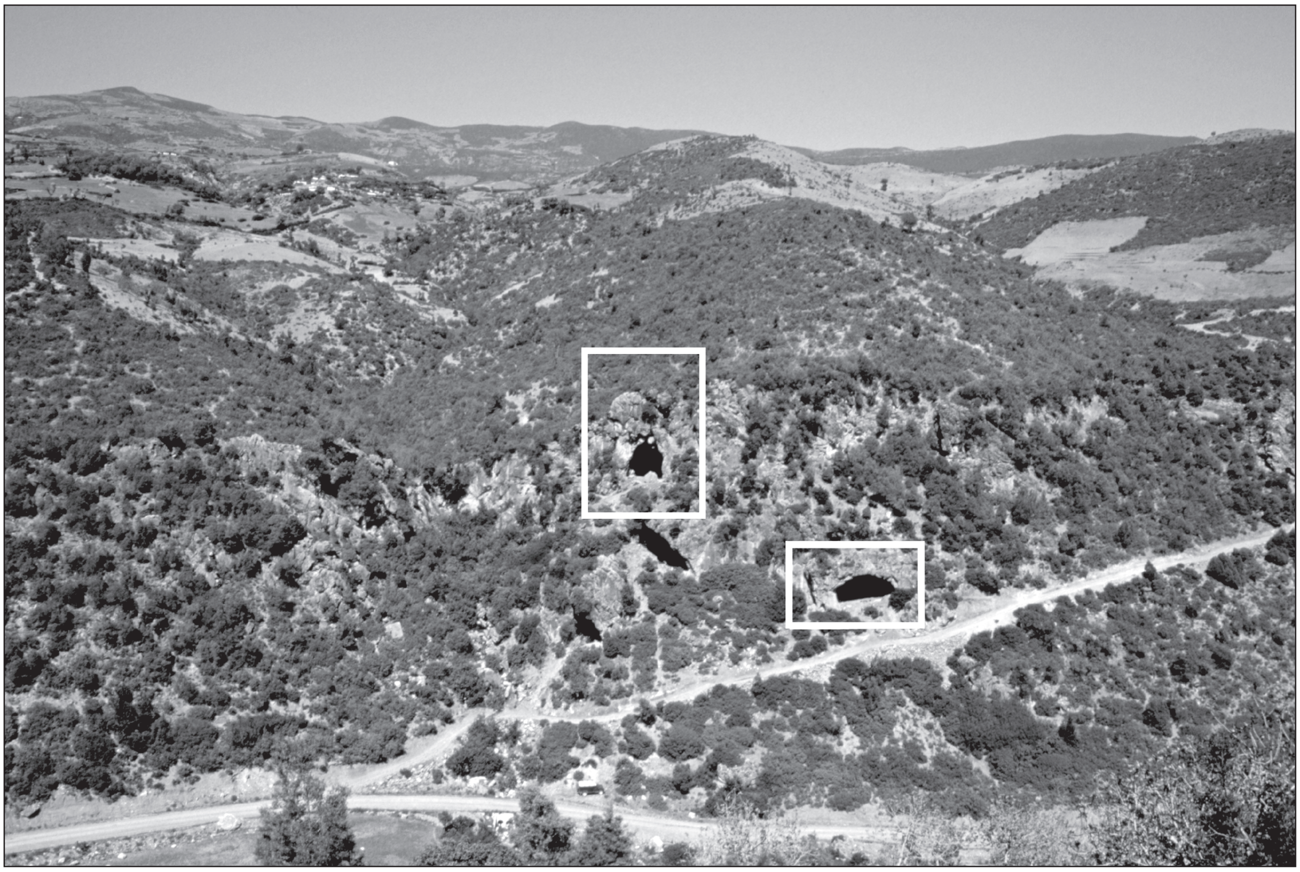

Figure 2. *Hattab II and Hattab I caves. Hattab II is the upper cave.*

The cave is one of a number of cavities cut into a massive calcilucite (calc-mudstone) at the end of the gorge (Fig. 2). It includes two caves, designated Hattab I and Hattab II, the latter proving the only one with substantial evidence of Iberomaurusian activity. Hattab II is a roomy well-lit cave, relatively dry and with a large entrance facing upstream towards the nearby modern village. The cave lies approximately 30 m above the present valley floor. A spring-fed stream flows close to the cave entrance, descending via a series of cascades to the valley floor below.

The cave is approximately 14 m deep by 12 m in maximum width. Its contained sediments consist primarily of silty carbonates capped, towards the back, by a well cemented stalagmite (Figs. 3 & 4). The sediments can be divided into eight distinctive sub-units, described in Figure 4. They are most clearly developed towards the back of the cave in test trench 3, in which the human burial was discovered. The skeleton lay approximately north–south in what appears

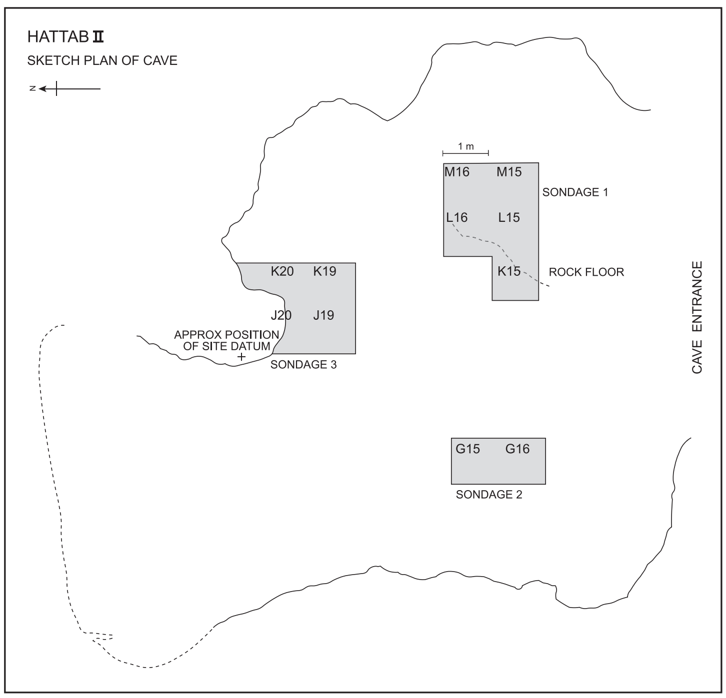

Figure 3. *Hattab II: plan of interior with position of test trenches.*

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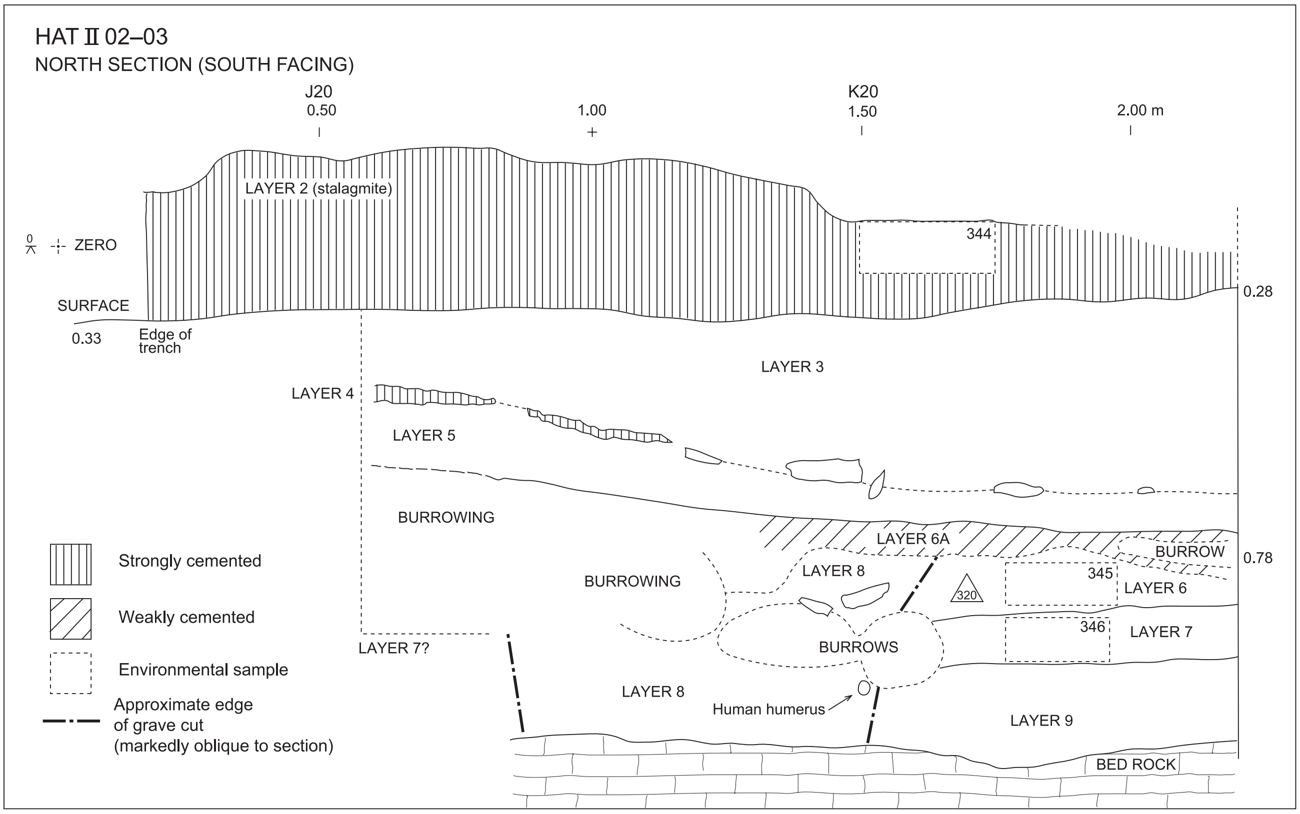

Figure 4. *Hattab II: north profile of sondage 3 showing lithostratratigraphic sequence and position of the burial. Layer 2: well-cemented stalagmite. Layer 3: light-grey silty carbonate, stoney (angular-subangular); Munsell 10 YR 4/3. Layer 4: cemented silts; some stones 2–4 cm; Munsell 10 YR 6/4. Layer 5: light grey silty carbonate, rounded gravel, powdery; Munsell 10 YR 4/3. Layer 6a : pinkish cemented silts, more or less stone-free but gritty in places; Munsell 10 YR 6/3. Layer 6: light grey silty carbonate with concretions; some charcoal; Munsell 10 YR 4/4. Layer 7: yellowish silty carbonate, very compact; Munsell 2.5 YR 6/6. Layer 8: light grey silty carbonate with subangular limestone clasts; no Munsell reading (grave fill); also contains charcoal and burnt and unburnt bone fragments. Layer 9: brown silty carbonate with sub-angular limestone clasts; charcoal flecks.*

to be a vertical cut dug to the bedrock surface (Fig. 4). The burial lay within light grey silty carbonate sediments that also contained lithic artefacts, animal bone and flecks of charcoal. In section, the grave could be observed to cut through layers 6, 7 and 9 (Fig. 4). It was partly sealed by a lightly cemented pinkish silt (6a), though this was obscured in places by clearly defined animal burrows. Fortunately it was possible to excavate the contents of the burrows separately (which contained much looser sediments) and to remove any potentially extraneous material at the top of layer 8, which contained the burial. The burial itself was in anatomical position with all of the bones in articulation and there were no signs of disturbance. The intact nature of the grave may have been partly due to the stalagmite capping (layer 2) that formed a protective shelf above. The bones were also lightly cemented together and to the cave floor. A similar light surface concretion was noted on some of the lithic artefacts in the sediments surrounding the skeleton.

The human remains

Condition

The skull and a small part of the postcranial skeleton were uncovered at the end of the 2002 field season. The skull was lifted at this stage. The rest of the skeleton was excavated in 2003. The body was buried flexed on the left side with its feet more or less against the back wall of the cave (Fig. 5). The skull was found in an upright position, which is unexpected given the arrangement of the rest of the body. The position of the head may reflect the limitations of the grave cut.

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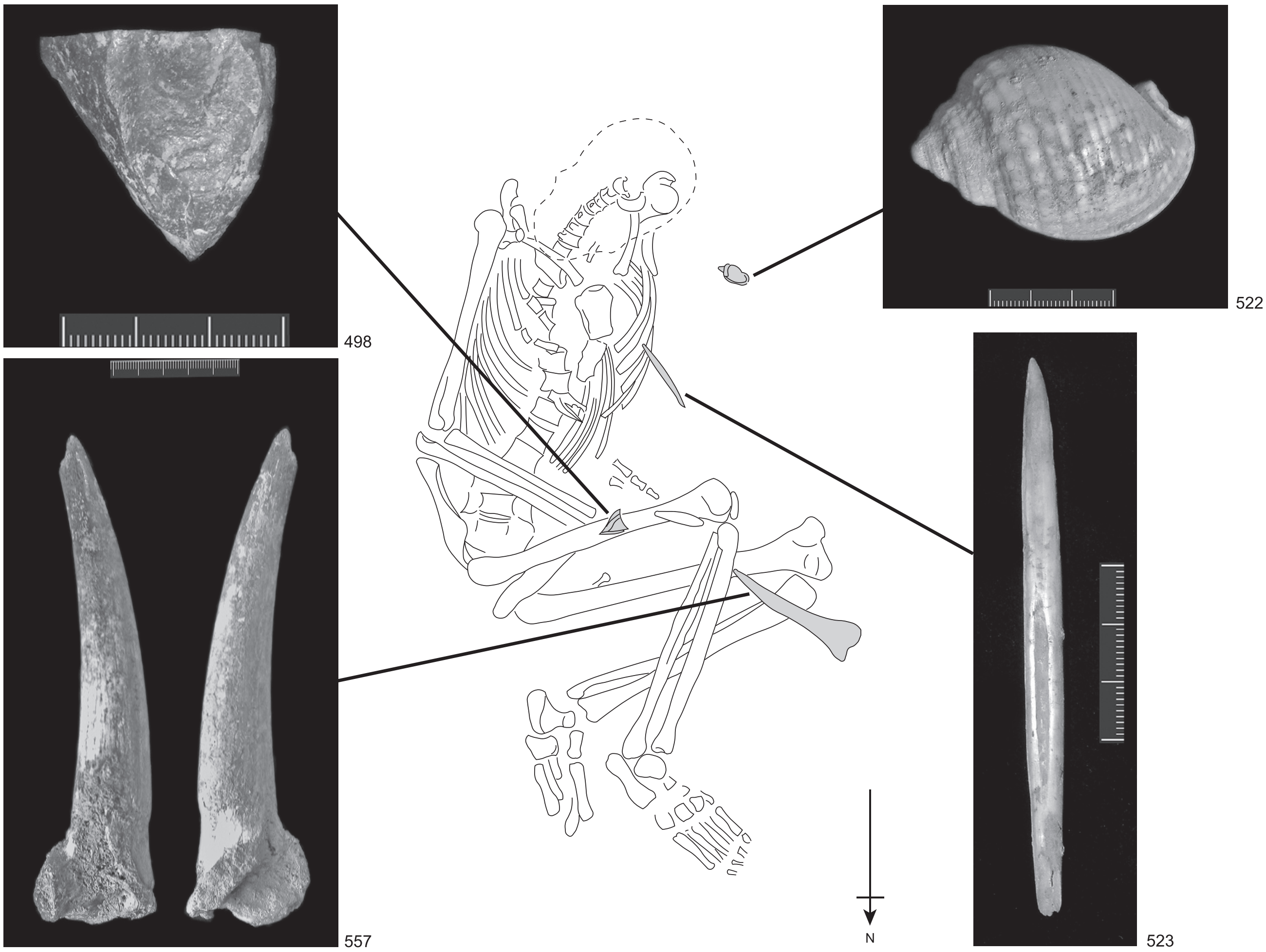

Figure 5. *The articulated male burial at Hattab II and related grave goods.*

The skeleton is in exceptionally good condition and virtually complete. It includes the skull, parts of the hyoid, all of the axial skeleton, long bones, patellae and numerous bones from the hands and feet. Much of the skeleton is heavily cemented and most bones are covered with a thin surface concretion. The sternum and some of the ribs are broken, and both scapulae have been perforated, all possibly as a result of compression in the grave. Much of the skeleton of the upper body was lifted as a single block, which includes the scapulae, clavicles, sternum, ribs, most of the vertebrae and the left humerus and radius, which have not yet been separated. A non-human vertebra formed an integral part of this block and is concreted to the cervical vertebrae, ribs and left clavicle. The positioning of bones within the block indicates that the skeleton was fully articulated when buried, and that the bones collapsed into the position in which they were found following decay of the soft tissues. A second block comprises the first and second lumbar vertebrae and the distal left ulna, which was positioned below the vertebrae. A third block comprises the sacrum, three lumbar vertebrae and the right radius and ulna. These lower arm bones lie across the third and fourth lumbar vertebrae. The position of these bones indicates that the arms were bent at the elbow and tucked closely against the side of the body.

The skull (Fig. 6) is almost complete but has a large almost circular hole at the base, where a portion of the anterior part of occipital bone, the petrous parts of the temporal bones and a small part of the sphenoid and posterior part of the vomer have broken away. The breakage is more or less symmetrical but most of the missing parts could be identified in the sediment lifted with the skull, suggesting that the damage occurred after burial. Removal of the adhering sediment and reconstruction of the cranial base will need to be carried out before a complete description of the cranial morphology can be made.

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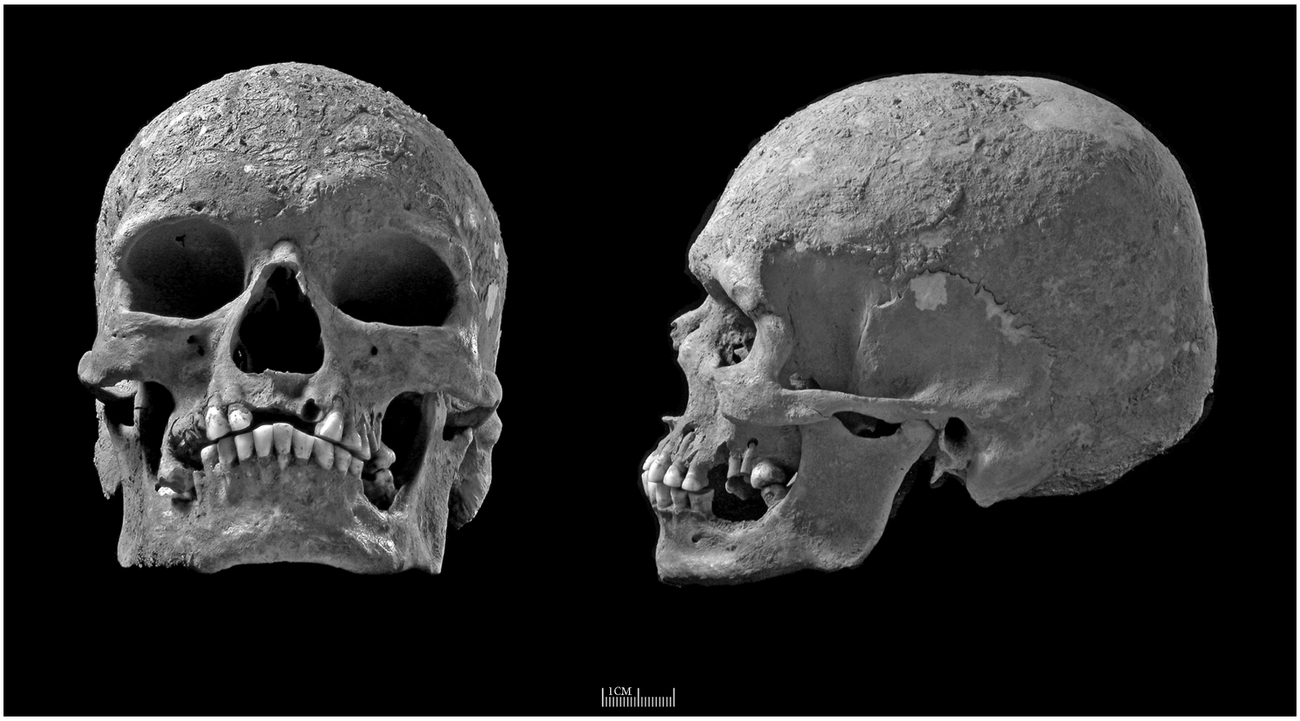

Figure 6. *Anterior and left lateral views of the Hattab II skull. (Photograph: Ian Cartwright.)*

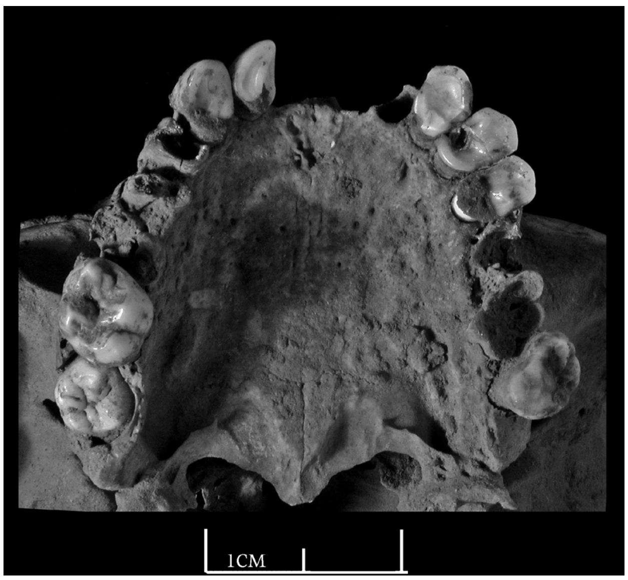

Figure 7. *View of the maxillary dentition. (Photograph: Ian Cartwright.)*

Figure 8. *View of the mandibular dentition. (Photograph: Ian Cartwright.)*

The dentition is incomplete, but most of the losses can be attributed to *ante mortem* loss caused by disease or intentional removal. The upper left second incisor appears to have been lost *post mortem* or shortly before death since there is no remodelling of the alveolar bone (Fig. 7). Both upper central incisors are missing and the alveolar bone in this region of the maxilla has remodelled to form a sharp ridge, indicating that this loss occurred some time before death. Since ablation of the central upper incisors was common during the Iberomaurusian period, deliberate removal during later childhood or adolescence is the most

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Table 1. *Postcranial metrics of Hattab II skeleton compared to samples from Taforalt, Columnata and Afalou. Measurements are in mm. Values shown for the comparative series are the mean value and range of values for males and females.*

	Hattab	Taforalt females	Taforalt males	Afalou females	Afalou males	Columnata females	Columnata males
Tibia length	374	365.5 (350–381)	399.6 (383–434)	379.1 (345–394)	389 (351–412)	375.4 (363–383)	421.3 (383–444)
Fibula length	360	359.8 (349–381)	391.9 (366–423)	372 (342–388)	376 (345–390)	329.3 (314–339)	374 (361–385)
Humerus length	314	315.8 (294–330)	336.0 (325–349)	329.2 (302–335.5)	340.5 (324.5–349)	306.6 (281–325)	322.2 (297–337)
Radius length	247	236.3 (225–250)	266.8 (248–290)	257 (238–265)	266.2 (250–281)	228.7 (219–240)	253.8 (240–260)
Ulna length	267	259.9 (245–271)	288.2 (272–310)	271 (249–283)	292 (283–304)	253.0 (240–260)	275.8 (265–285)
Clavicle length	150	143.7 (129–153)	159.3 (151–168)	161.5 (149–174)	169.6 (155–185)	137.3 (124–144)	156.0 (152–165)

probable explanation for the absence of these teeth. The configuration and wear of the mandibular teeth supports this interpretation (Fig. 8). The lower anterior teeth show a pattern of differential wear that is typical for individuals exhibiting ablation (or early loss) of the upper central incisors. The lower central incisors have emerged above the normal occlusal plane, and exhibit almost no wear. There is minimal wear on the mesial sides of the lower lateral incisors and heavy wear on the lower canines and premolars. This pattern of differential wear results in a pronounced upwards curvature towards the lower central incisors. This configuration is common among the mandibular series from Taforalt and is found in association with ablation of the upper central incisors. Among the post-canine teeth, four molars are completely absent with partial remodelling of the surrounding bone. These losses are likely to have been caused by caries, which affect many of the surviving teeth. Three molars and four premolars exhibit gross caries, such that it is no longer possible to determine the location at which the lesion initiated (Hillson 2001). Of these, two molars and three premolars are represented only by their roots, with exposure of the open root canals.

Sex

The sex of the skeleton was determined in reference to the skull, the pelvis and the sizes of the bones.

The sexually diagnostic features of the skull are ambiguous, with some features, particularly those of the cranial base, tending towards a more female expression. The occipital is partially obscured by sediment, but the over-all morphology of the external surface is fairly smooth, with only a slight expression of the superior and inferior nuchal lines. The mastoid processes are of moderate volume but do not project far below the inferior margin of the external auditory meatus. The glabella is fairly prominent with a moderate loaf-like projection when viewed from the side, but the supraorbital ridges are not particularly well defined. The supraorbital margin of the right orbit is fairly sharp. The mandible has a square and robust appearance with quite pronounced muscle attachments, but the mental eminence is only moderately expressed. Following the criteria of Buikstra & Ubelaker (1994), the scores given to these cranial indicators are ambiguous in relation to sex determination (mastoid process and mental eminence) or suggest a probable female (nuchal crest, supraorbital margin) or probable male (prominence of glabella).

In contrast with the over-all impression from the skull, the morphology of the pelvis clearly indicates a male. The pubis exhibits slight sub-pubic concavity, has a broad and flat ischiopubic ramus, and has a slight ridge on the ventral surface but lacks a well defined ventral arc. The greater sciatic notch has a narrow configuration and there is no preauricular sulcus.

Skeletal dimensions can provide an indication of sex if they fall outside the range of overlap between males and females in an appropriate comparative series. Approximate lengths were measured for the tibia, fibula, humerus, ulna, radius and clavicle of the Hattab skeleton (Table 1). Femur length could not be measured accurately because the femoral heads have not yet been separated from the acetabulae. Measurements are compared to those for males and females from Taforalt and Columnata and Afalou (both in Algeria), using data from Ferembach *et al.* (1962) for Taforalt, Chamla (1970) for Columnata and Arambourg *et al.* (1934) for Afalou.

For most bones, the dimensions of the Hattab skeleton fall within the range of values for females from Taforalt and Afalou but below the range for males from both of these sites. The Hattab postcranial

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dimensions are comparable to an average-sized individual from Columnata. More specifically, tibia length falls within the range of measurements for females only, radius and ulna lengths are within the range for males only, and humerus, fibula and clavicle lengths fall in an intermediate range or within the range of overlap between males and females.

Stature estimates were calculated using the modified Trotter and Gleser equations presented by Robins & Shute (1986). Estimates were determined for each of three arm bones, and the average of the three estimates was calculated. Measurements of the leg bones were not used because the formulae for the fibula produce stature estimates that are consistently and improbably low. The formulae for the tibia are sensitive to the measurement technique, which seems to have varied between the comparative series for which published data are available (Table 1). Stature estimates for the Hattab skeleton are 167.2 cm using the equations for males and 162.9 cm using the equations for females. Using the same technique, average stature estimates are 173.8 cm for males and 161.0 cm for females from Taforalt, 169.7 for males and 159.1 cm for females from Columnata, and 174.5 for males and 170.1 cm for females from Afalou. The stature estimate for Hattab is consistent with a relatively tall female or a relatively short male in comparison to the other Iberomaurusian samples.

Cranial and mandibular measurements from the Hattab skull were compared to those of male and female skulls from Taforalt (Ferembach *et al.* 1962), Afalou (Arambourg *et al*. 1934), Columnata (Chamla 1970) and the female skull from the Taza locality in Algeria (Meier *et al*. 2003). The Hattab cranial dimensions are most similar, over all, to the average values for females from Taforalt (Table 2). The mandibular dimensions are slightly smaller than the average values for females from Taforalt and Afalou and comparable to those of females from Columnata. The Hattab skull is larger than the Taza female skull for all cranial and mandibular measurements. The dimensions of the Hattab skull are below the average values for males from Taforalt, Afalou and Columnata for all cranial and mandibular measurements, but overlap with the range of values for males from either Taforalt or Afalou or both sites for all measurements. It is worth noting here that dimensions of male and female crania from Taforalt do not overlap for several of the measurements presented by Ferembach *et al.* (1962), suggesting that size may have been one of the parameters used for the original sex determination of the Taforalt series.

Age

The age of the skeleton at death was determined in reference to the skull, dentition and postcranial development.

The external cranial sutures are obscured by a surface concretion of varying thickness. Their degree of closure could not be properly evaluated. On the maxilla, the incisive suture is fully obliterated. The anterior and posterior median palatine sutures and the transverse palatine suture show significant closure. The maxillary sutures support an age estimation of early adulthood (Buikstra & Ubelaker 1994). Fusion of the spheno-occipital synchondrosis, which occurs during adolescence, is complete.

The surviving tooth crowns and roots and the configuration of the alveolar bone indicate that all but

Table 2. *Cranial and mandibular dimensions of the Hattab II skull compared to samples from Taforalt, Columnata, Taza and Afalou. Measurements are in mm.*

	Hattab	Taforalt females	Taforalt males	Afalou females	Afalou males	Columnata females	Columnata males	Taza female
Maximum cranial length	185	182.7 (177–188)	194.6 (188–206)	~185 (173–196)	~193 (183–206.5)	183.2 (174–189)	187.8 (178–191)	173
Maximum cranial breadth	134	139.7 (135–144)	146.1 (138–152)	~141.5 (131.5–154)	~144.5 (133–159)	144.4 (140–147)	142.7 (134–153)	136
Bizygomatic breadth	132	131.5 (126–134)	147.4 (137–152)	135.8 (130–144.5)	141.6 (126.5–152)	137	146 (142–150)	126
Biorbital breadth	101	98.3 (95–103)	104.8 (99–110)					
Orbit height	29.5	29.7 (28–31)	32.0 (29–36)	31.1 (27.5–35.5)	31.0 (27.5–34.0)	35	33 (31–35)	30
Maximum mandible length	100	103.7 (92–113)	114.3 (104–121)	105.2 (96–111)	108.3 (100–119)	101.5 (97–107)	107.9 (103–113)	92
Bicondylar breadth	115	119.7 (117–126)	128.8 (117–138)	115 (110–122)	124.1 (117–131)	114.7 (112–117)	122 (114–127)	112

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three of the permanent teeth had fully emerged prior to death. The upper and lower left third molars were fully emerged, suggesting a minimum age of about 18 years. The upper right third molar had started to emerge, with the entire occlusal surface emerged through the alveolar bone. The lower right third molar was just below the bone level at the time of death. The discrepancy between the state of emergence of the right and left third molars is quite striking but, since delayed emergence of the third molars or failure to emerge are relatively common, this is not a reliable indicator of immaturity. The lower right second molar remains deep within the mandibular body. It is several millimetres below the level of the adjacent unerupted third molar, and its emergence does not appear to be obstructed by this tooth. A radiograph shows that the roots of the second molar had not achieved their expected adult length but further growth may have been inhibited by the position of the tooth in the jaw, so the state of root formation of this tooth may not be a reliable indicator of age at death.

Detailed evaluation of age at death from tooth wear is not possible owing to extensive *ante mortem* tooth loss, severe caries affecting many of the surviving teeth, abnormal molar emergence and asymmetric wear. The anterior teeth exhibit an unusual pattern of wear that is influenced by the early loss of the upper central incisors. In the lower jaw, wear is lowest on the central incisors followed by the lateral incisors and canines and highest on the surviving premolars. Surface wear was scored using the Smith System for the canines and premolars and the Scott system for molars, following descriptions in Buikstra & Ubelaker (1994). Surviving upper and lower premolars exhibit Smith's stage 6. Wear of the maxillary canine is more extensive on the left side than on the right (Smith stages 6 and 4 respectively). Only two molar crowns could be scored for wear. The upper right second molar exhibited minimal wear (Scott stage 1), but this low wear is likely to have been affected by the non-emergence of the corresponding lower second molar. The mesial lingual cusp of the upper left third molar exhibited Scott's stage 2. Wear of this tooth would have been affected by the unusual orientation of the crown, which had its occlusal surface angled towards the cheek, and by the fact that the occluding lower third molar exhibited severe occlusal caries. The amount of wear on the molars is consistent with a young adult but, in view of the numerous confounding factors, this may under-estimate the age of the Hattab individual.

The state of fusion of the postcranial skeleton indicates an age at death of approximately 25–30 years. The long bones, scapula, pelvis, atlas and axis are fully developed. The latest long bone epiphyses to complete fusion are the proximal humerus and the distal radius and ulna. Complete fusion of these epiphyses indicates a minimum age of about 20. The final stages of development of the pelvis involve fusion at the iliac crest and ischial ramus, with fusion complete at approximately 22 years. The final stages of development of the scapula are fusion of the inferior angle and vertebral border. Fusion is typically complete by 23 but may occur a few years earlier (Scheuer & Black 2000).

The sternum is consistent with an early adult age. The individual sternabrae of the mesosternum are fully fused to one another, with no traces of fusion remaining on the anterior surface. The posterior surface could not be observed but typically fuses in advance of the anterior surface (Scheuer & Black 2000). The sternal ends of the clavicle are still undergoing the late stages of fusion, suggesting an age of 24–29 (Scheuer & Black 2000) or under 27 (Kreitner *et al.* 1998). The acromial ends of both clavicles are fully formed. Most of the ribs are still encased within a block of sediment. The heads of the first ribs exhibit signs of recent fusion while those of the second rib are fully formed. Fusion of these small epiphyseal flakes is usually complete by the early 20s.

The over-all development of the sacrum indicates a minimum age at death of about 25. The centres and lateral elements of the sacral vertebrae are fully fused to one another. Complete union of the bodies of the first and second sacral bodies does not usually occur until about 25 years (Scheuer & Black 2000). The centra of the first and second sacral vertebrae appear to have fused not long before death, since the margins of the individual vertebrae can be identified as two distinct ridges. The sacroiliac and lateral margin epiphyses are fully fused to the sacrum, suggesting a minimum age of 18. The superior epiphyseal surface is partly obscured by the fifth lumbar vertebra, but the rim is fully formed, indicating that fusion of the superior annular ring was complete or almost complete.

Morphological changes of the pubic symphyseal face were evaluated according to the Todd scoring system and the Suchy-Brooks system for males, following descriptions in Buikstra & Ubelaker (1994). The ridge and furrow system has been largely obliterated on both sides. Some bony nodules are present and the surface has a granular appearance. There is no lipping of the symphyseal dorsal margin or bony ligamentous out-growths. These surface changes correspond to Todd's Phase 4 or 5 and Suchy-Brooks phase 3 and are consistent with an age at death of between 25 and 30 years.

Other human remains

Other isolated elements and fragments of human bones and teeth that were found during the excavations demonstrate that remains of at least three additional individuals were deposited in the cave before or after the burial of the Hattab skeleton (Table 3). The remains are those of at least one adult represented by a fused distal fibula and proximal foot phalange, as well a young child represented by a fragmentary set of long bones and an older child or young adolescent represented by a partial mandible and unworn premolar. The isolated adult fibula fragment was found in the sediment surrounding the adult skeleton, lying just above the lower right arm bones. Although it was lifted as part of the block and not identified as a separate element during excavation, the fragment was not firmly concreted to other bones in the block. It may have been deliberately placed on the lower arm but it is also possible that it was introduced unintentionally when the grave was filled. There is no evidence that the fibula owes its presence to animal burrowing; parts of the skeleton were matrix-supported but otherwise uncemented and this implies contemporaneity in terms of the burial process. However, it is clear that the fibula is more heavily fossilized than the adult skeleton and similar in appearance to the mandibular fragment and associated tooth, thus suggesting they were part of the deposit used to back-fill the grave.

Grave goods

Figure 5 illustrates the position of objects in direct association with the burial and interpreted as grave goods. They are listed in Table 4. One of the most culturally diagnostic items is a small bladelet core of Late Palaeolithic Iberomaurusian type found resting on the right thigh of the skeleton. Of interest too because of the obvious links with the coast, less than 10 km away, is a *Murex* shell. Apart from a small fragment also from layer 8, this is the only complete marine shell found in the deposits and that suggests that it was deliberately collected and placed with the burial. The only other potential form of ornamentation found on the skeleton was an isolated vertebra of a large mammal concreted to the vertebral column and to the left clavicle and ribs. The sedimentation suggests that the vertebra forms an integral part of the burial and its position on the ribcage indicates that it may have been a pendant. No ochre was present either on the skeleton or in the burial area.

The two bone *sagaies* (points) are not particularly indicative of period but are interesting because of their association with this individual. Other

Table 3. *Other human remains from Hattab II.*

Find	Sq	Layer	Find	Age/type	Comment
02/224	J19	1	Parietal fragment	Adult	Preservation matches mandibular fragment.
02/14	J20	1	Partial unfused long bones (humerus, femur, radius, tibia, ulna and fibula)	Young subadult	Age at death was estimated at approximately 2 years based on the length of the radius (96 mm).
02/154	J20	1/6 burrow	Mandibular fragment	Older subadult	Broken at position of right first molar and left second molar. Root sockets indicate recent loss of the left deciduous canine and one of the molars. Age at death is estimated at 11–12 years.
02/000	J20	burrow	Permanent left second premolar	Older subadult	Unworn, discoloured and complete apart from the root tip. Fits mandibular fragment.
02/16	G15	2	Proximal foot phalange, first digit	Adult	Less robust than Hattab skeleton.
03/000	K20	8	Distal left fibula fragment	Adult	Grave fill, just above the lower right arm bones.

Table 4. *Objects identified as grave goods associated with the burial (see Fig. 5).*

Find	Description	Comments
498	Bladelet core	
499	Sagaie	Broken tip (34 × 35 mm), highly polished and more or less cylindrical in cross-section.
522	Murex shell, family Muricidae	No perforation or other modification.
523	Sagaie	Complete apart from ancient break at tip. 114 × 6 × 4 mm. Flat ogival section with a longitudinal groove running along one side. Possibly the inner shaft of the bone on which the blank was made.
557	Horn core of *Gazella rufina*	Located just above skeleton in the knee joint region.
570	Chopped bone splinter	Unidentified animal bone (64 × 20 × 8 mm). In ribcage of burial.
--	Large mammal vertebra	Unidentified.

examples have been recorded in Iberomaurusian levels at the nearby cave of Kehf el Hammar but, so far, not in relation to human burials. The presence of the gazelle horn core may be indicative of the hunted fauna. The identification of *Gazella rufina* is based on the characteristic sub-triangular cross-section at the base of the horn core, the swept back appearance of the core in relation to its base and the smooth surface typical of this species (Arambourg 1957). This species survived in mountainous regions of northern Algeria until the early twentieth century. It may be significant that *G. rufina* is rare throughout the Maghreb in a very well recorded Late Palaeolithic faunal record, leading to the conclusion that it was an ecological specialist. This is supported by its vivid colouration, that suggests it lived in woodland rather than desert or open steppe (Kowalska & Rzebik-Kowalska 1991). A mandible of red fox (*Vulpes vulpes*) was also recorded in layer 8 but exhibited no clear association with the burial.

Lithic technology

105 pieces of lithic debitage and 19 retouched tools were recovered from trench 3, in the same area as the burial (Fig. 3). Of these, relatively few (2 per cent) came from the sediments overlying the burial (layers 1–5). By far the richest layer was the grave fill itself (layer 8), which produced 45 per cent of all lithic artefacts.

In the uppermost layer (1), it was noticeable that amongst the diagnostic tools was a small geometric microlith, a broad crescent and a retouched flake, all identifiably Neolithic forms. No unambiguously Neolithic stone artefacts were found below this surface layer but it may be significant that occasional ceramic sherds of Cardial ware (Habiba Atki pers. comm.) were recorded in layer 3 and one tiny fragment of heavily abraded ceramic as low as layer 7. The fact that a backed bladelet of Late Upper Palaeolithic type was located in layer 4/5 implies that there may have been some mixing of sediments, unsurprising given the presence of animal burrows in these upper layers.

From an archaeological perspective, the sediments of the grave fill contain a remarkably homogeneous assemblage of Late Palaeolithic Iberomaurusian artefacts. Amongst the eleven retouched tools recovered were straight-backed bladelets and the tip of a curve-backed point. There were no microburins nor any evidence of microburin facets on the microliths themselves. All of the retouched tools in this layer are on either coarse cherts or flint. The debitage, of the same raw materials, comprises predominantly laminar flakes struck from opposed platform and single platform cores, similar to the example resting on the right thigh of the skeleton. The presence of tiny chips in this layer suggests that some knapping took place within the cave and that sediments of the cave floor were used to cover the grave pit.

There is no obvious variation in the relative quantity or types of raw materials employed throughout the stratigraphic sequence. Flints and fine-grained silicified limestones predominate and must have been deliberately selected for their superior knapping qualities. The main source of lithic material appears to be the river gravels immediately below the site.

Palaeoenvironmental analyses

Three bulk sediment samples were collected in 2002 in test trench 3 at the rear of the cave (Figs. 3 & 4, Table 5) and processed for biological remains and artefacts. Samples 345 and 346 were floated for carbonized plant remains, which were collected on a 250 μm sieve mesh. When dry, the heavy residue retained on the 0.5 mm mesh was dry-sieved into various fractions and sorted under a binocular microscope. Because of the paucity of small finds, the fine residue (< 1 mm) was not sorted. Sample 344 consisted of sediment adhering to the bottom of the stalagmite boss. This was removed by gentle washing over a sieve and the residue was then sorted to 2 mm.

Weathered potsherds in sediment removed from the base of the stalagmite boss (344) suggests that the boss formed during the latter part of the Holocene. Probable ceramic fragments recovered in sample 346 could imply a relatively recent date for the deposition of this horizon but these fragments could be contaminants that fell down voids or rodent burrows.

Table 5. *Palaeoenvironmental samples (✓: present).*

Sample	Layer	Weight (kg)	Lithics	Ceramic	Charcoal	Land snail shell	Reptile	Bird	Small mammal	Large mammal
344	2	12.8		✓	✓	✓				✓
345	6	2.6	✓		✓	✓	✓	✓	✓	✓
346	7	3	✓	✓?	✓	✓				✓

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Other than fragmentary land snail shells, faunal remains were uncommon in the samples. Sample 345 produced some rare small vertebrate material (including a lizard vertebra and an indeterminate bird bone) and amongst this collection were a few small mammal remains including a mandible of *Mus spretus* also from layer 6. The low density of small mammals and bird remains suggests that owls or other birds of prey were not using the cave.

Charcoal

As much of the charcoal consisted of friable, poorly preserved fragments, only a nominal amount was submitted for analysis. The charcoal examined consisted of pieces mostly measuring less than 2 mm in radial cross-section. Of these, the largest fragments were isolated from each sample and prepared for examination using standard methods (Gale & Cutler 2000). The anatomical structures were examined using a Nikon Labophot-2 microscope at magnifications up to ×400 and matched to reference slides of modern wood. The results reveal a very low range of wood species (Table 6).

Phytoliths

Information on past vegetational structure and dynamics can be provided by phytolith analyses (Ishida *et al.* 2003; Parker *et al.* 2004). Phytoliths, also known as plant opals or opaline silica, are solid deposits of SiO_2 ($SiO_2.H_2O$) produced in living plants (Piperno 1988). The silica bodies are highly stable and resist decomposition when the plant dies. Unlike pollen, phytoliths are particularly useful in identifying Gramineae to taxa or species level (Barboni *et al.* 1999). The methodology for separating and extracting plant phytoliths from sediment samples is described elsewhere (Parker *et al.* 2004).

The results presented in Figure 9 are in order of stratigraphic context. The total number of phytoliths recovered ranged from 17 to 1327 per sample. The largest sample came from layer 6 (sample number 400). It was dominated by grass forms, with 36 per cent short cells and 48 per cent long cell forms. The short cell forms comprised 11 per cent Pooid, 12 per cent Panicoid, 3 per cent Chloridoid and 10 per cent other grass types. Ligneous dicotyledenous forms accounted for 3 per cent and non-grass long cells for 6 per cent of the total. 6 per cent came from short-cell pitted forms resembling those derived from Pinaceae. The high proportion of dendritic forms (5 per cent) is probably representative of mature grass panicles. Although these could have entered the cave naturally as wind-borne items or in animal coprolites, it is more likely that they did so through human activity, as the sediments also included ash and charcoal and irregular phytolith morphotypes commonly associated with ligneous tissues of pine wood. The preponderance of grass types suggests spring or early summer occupation of the cave. The presence of a few pine family phytoliths is intriguing since this genus was not identified amongst the charcoals in any of the layers (see above) but could have been introduced as fuel.

The phytoliths recovered from the burial itself (sample number 502b), though relatively sparse, were dominated by non-grass morphotypes with 13 per cent circular rugose forms derived from ligneous dicotyledonous plants. Cork cell forms contributed 6 per cent of the sum. Short-cell grass forms comprised 12 per cent of the total sum with 5 per cent Panicoid forms and 1 per cent Chloridoid forms present. No Pooid forms were present in the sample. Other grass short cells accounted for the remaining 6 per cent of the sum. Long cell grass forms accounted for 14.5 per cent of the total. Non-grass long cells formed over 50 per cent of the sum. The slightly higher proportion of ligneous woody types in the burial deposit seems to be consistent with the observable pres-

Table 6. *Identification of selected wood charcoals.*

Sample	Square	Layer	Description	Comment
713	K21	6	*Quercus* sp. Deciduous oak *Quercus* sp. Evergreen oak	8 fragments of heartwood 1 fragment
715	K21	7	*Quercus* sp. Deciduous oak	5 fragments
706	J20/21	8	*Quercus* sp. Deciduous oak	9 fragments under burial
707	J20/21	8	*Quercus* sp, Deciduous oak ?*Pistacia* sp. Lentisc/terabinth	3 fragments of heartwood under burial Highly degraded, inconclusive
698	K20	9	*Quercus* sp. Deciduous oak	6 fragments of heartwood
703	K20	9	*Quercus* sp. Deciduous oak Nutshell, unidentifiable	2 fragments of heartwood 3 fragments
719	K21	9	*Quercus* sp. Deciduous oak	6 fragments

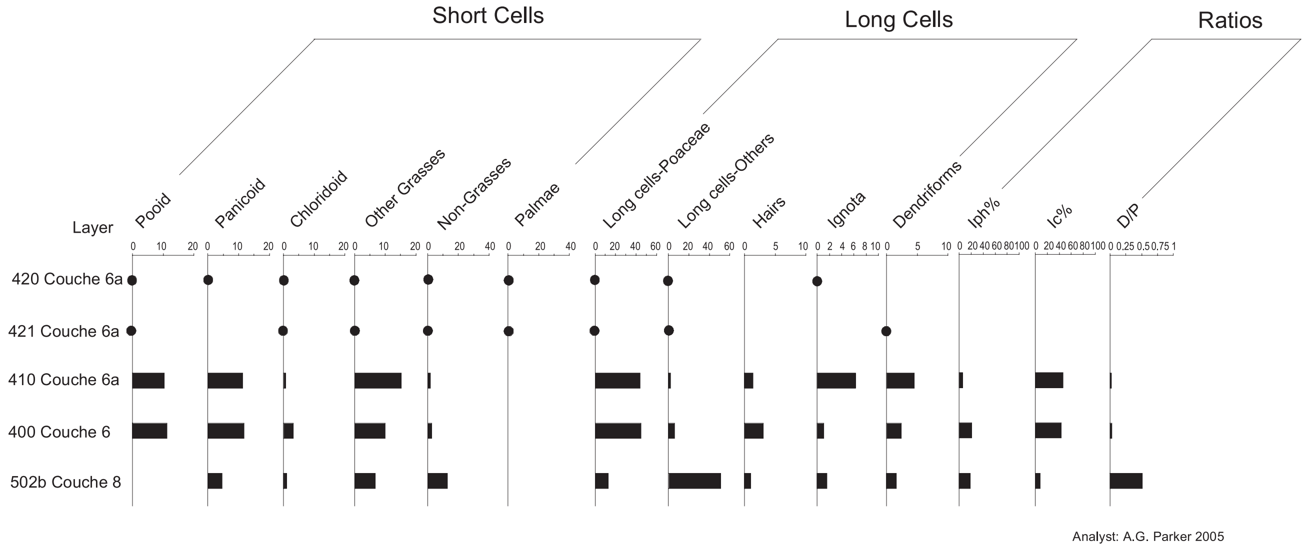

Figure 9. *Phytolith analytical results from Hattab II. Abbreviations: D/P ratio represents the ratio of ligneous dicotyledon morphotypes (circular rugose) (D) against Poaceae morphotypes (P), and is used as a proxy of the tree cover density with a value of 1 representing maximum woodland density and zero none; the Iph(%) aridity index provides a measure of mesic and xeric grassland conditions. The climatic index (Ic%) indicates the influence of climate on the ratio of C3 to C4 morphotypes, and has been used to distinguish cool wet from warm dry conditions.*

ence of oak charcoal in the same sedimentary unit.

Potentially intrusive material was only identified as far down as layer 6a. It consisted of circular crenate phytoliths attributable to modern palms. It is likely that the palm morphotypes were derived from the contemporary vegetation. They could have been introduced by recent animal burrowing. This is also supported by other observations made above.

Based on comparisons of the ratios of C3 to C4 morphotypes (a classification which refers to differing photosynthetic pathways in the source plants: Twiss 1987), it is clear that the landscape at Hattab was characterized by mixed Pooid C3 and Panicoid C4 tall mesic grassland (i.e. moderate humidity), with some C4 xeric (dry habitat) elements denoted by the low proportion of Chloridoid morphotypes, at least during the formation of layer 6. The association of high numbers of grass morphotypes and the ashy nature of samples 400 (layer 6) and 410 (layer 6a) together evoke the deliberate gathering and burning of grasses for fuel. The existence of some degree of local woodland cover is attested in layer 8 by ligneous phytolith types and by charcoals of deciduous oak in this and some of the other earlier layers (7 and 9).

Dating

Efforts to obtain a direct AMS radiocarbon date on bone samples of a rib and the left and right clavicles of the skeleton failed due to poor preservation of bone collagen. Nevertheless, the presence of burnt lithic artefacts, including one immediately adjacent to the skeleton, allowed a thermoluminescence (TL) age determination of 8900±1100 years ago to be made (K0311). This date, though unexpectedly young, is securely within the same archaeological layer as the burial.

The TL dating was undertaken at the Australian National University, using a combined additive and regenerative measurement procedure. The sample was prepared under controlled laboratory lighting. Surface material (at least 2 mm) was discarded and the central part was crushed and etched with HCl. TL signals in the 350–420°C range were measured under a nitrogen atmosphere using a heating rate of 5°C.s^{-1}. The slopes of the additive and regenerative growth curves were compared, and the additive slope was used to correct the regenerative growth. For this sample, the correction factor was 0.61, which is slightly low; a value close to 1.0 is considered optimal. The TL signal was recorded using a 9235QA PMT fitted with 7–59 and BG39 glass filters.

The internal and sediment gamma dose rates were calculated using INAA determinations of K, U and Th for the artefact and sediment samples respectively. For this sample, the internal dose rate dominated, owing to the relatively high concentrations of U, Th and K in the artefact. An estimated water content value of 5±2 per cent was used; wetter sediment conditions would cause the age estimate to be greater. Cosmic dose rate estimation used the

https://doi.org/10.1017/S0959774308000255 Published online by Cambridge University Press

equations of Prescott & Hutton (1994); the cave roof was determined to be 15 m thick, with some local variations. Beta attenuation factors of Mejdahl (1979) and dose rate conversion factors of Adamiec & Aitken (1998) were used in the age calculation.

Discussion

The surprisingly young age of the Hattab II burial prompts a review of the evidence for the Late Pleistocene and early Holocene population history of this region. What are the implications for interpreting continuity in the Palaeolithic archaeological record and the start of the Neolithic in Northwest Africa?

There can be little doubt that two distinctive technologies are represented in the cave sequence. As already noted, Neolithic tools and debitage as well as Cardial ceramics were recovered from the top of the sequence in surface finds of layer 1 and in layers 2 to 3. In contrast, layer 8 contained an undisturbed burial associated with lithic finds characteristic of the Iberomaurusian. Despite burrowing disturbance in the intervening layers, the assemblage from layer 8 shows no obvious admixture of material from above. There is no pottery or any diagnostically later lithic artefacts in the sediments of layer 8. Burnt finds are also notably absent in the layers immediately overlying the burial, which confirms that the artefact dated by TL was *in situ*.

Although as yet undated, the Neolithic at Hattab II fits well in the established pattern for other Cardial ware sites in Morocco. These are mainly caves and rock-shelters and are more densely concentrated in the littoral zones. The present known distribution extends from south of Rabat on the Atlantic coast to Hassi Ouenzga in eastern Morocco (Fig. 1). Apart from Hattab I, the other closest location to Hattab II with Neolithic Cardial ceramics is at Kaf Taht el Ghar (Daugas *et al.* 1999), about 50 km north of the Ouled Ali Mansour. The sequence at Kaf Taht el Ghar is relatively well dated by a series of radiocarbon and TL dates (Table 7). It shows a succession of occupations all typified by Cardial ware and with broadly overlapping ages. Except for the initial phase, the second and third phases have each produced evidence of geometric microliths with rectangular or trapeziform outlines (*à dos et à troncatures*) and debitage characterized by pressure flaked bladelets (Bouzouggar 2006). Examples of broad rectangular geometric microliths have also been noted at Wadi Tahadart (Tangiers). Neither pressure flaked bladelets nor broad rectangular microliths are present at Hattab II. The only diagnostic Neolithic tool types in the uppermost layer with Cardial ware were a small geometric microlith and a broad crescent on a flake. This implies that early Neolithic assemblages in this region may be characterized by some variability.

An interesting question concerns the start of the Neolithic in Morocco. Various models have been proposed for the transition to the Neolithic in the broader Atlantic and Mediterranean zones (Camps 1974; Zvelibil & Rowley Conwy 1986; Arnaud 1990; Zilhão 1993; 1998; Jackes *et al.* 1997; Arias 1999) as well as outside these areas (Ammerman & Cavalli-Sforza 1984; Thomas 1996; Whittle 1996). In this framework, a radically different idea was put forward, suggesting that the first cultivated cereals in northern Morocco appeared in aceramic cultural contexts (Daugas *et al.* 1989). The claim was principally based on the presence at Kaf Taht el Ghar of numerous cereal grains in a layer immediately underlying one containing Cardial ware ceramics. They were identified as the wheat species *Triticum dicoccum*, *T. monococcum*, *T. aestivicum* and barley (*Hordeum vulgare*) and were found together with charcoals that yielded ages of 9865±75 BP (Ly-7695) and 9910±50 BP (Ly-7287). However, this hypothesis was challenged by a detailed analysis of the layers, which revealed that the cereal grains most probably came from the overlying horizons with Cardial ware pottery. Further doubts were raised by AMS dating of one of the barley grains to 6350±85 BP (Ly-971 OxA; Ballouche & Marinval 2003, 53). Calibrated, such a date is only just outside the range of TL dates on ceramics from this site and clearly overlaps with other charcoal dates in the ceramic layer (Table 7). In the absence of hard evidence for an aceramic Neolithic in this region, a more realistic explanation is that the grains had percolated into the pre-ceramic lower horizons.

Little more detail can be added at this stage except that the Neolithic would appear to be intrusive to northern Morocco and that it followed a complex process of introduction (see for example El Idriss 2001; Linstädter 2003; Manen *et al.* 2007). Despite undeniable evidence for a break in continuity in material culture, it is interesting that caves in the same region of northern Morocco were occupied both in the Iberomaurusian and in the Neolithic. Equally, one aspect of social behaviour that does appear to continue throughout is the practice of single inhumation (albeit rare in the Iberomaurusian). This is illustrated particularly clearly at sites such as Rouazi-Skhirat, El Kiffen and Harhoura II, in Atlantic Morocco, where single graves are recorded, often accompanied by pottery vessels and small inventories of personal items (Daugas *et al.* 1989; Daugas 2002; Bouzouggar 2006).

What kinds of technologies might be expected in the transition from the Iberomaurusian to the early

Table 7. *List of early Neolithic dates (after Daugas* et al. *1989; 1998; Görsdorf & Eiwanger 1998; Bouzouggar* et al. *2006; Ballouche & Marinval 2003). Cal* BP *and* BC *AMS determinations are corrected using the IntCal04 calibration curve (Reimer* et al. *2004) and the OxCal 4.0 calibration software (Bronk Ramsey 2001). * Without marine correction.*

Site	Material	TL dates	^{14}C ages BP	Cal. ages BP 95.4% probability	Cal. ages BC 95.4% probability
Kaf Taht el Ghar	Charcoal		6050±120 (Ly-3821)	7246–6656	5297–4707
	Charcoal		6520±80 (Ly-7288)	7568–7290	5619–5341
	Wheat grain		6350±80 (Ly-971)	7430–7028	5481–5079
	Ceramic	6780±550 (Cle-126)			
	Ceramic	6350±800 (Cle-127)			
	Ceramic	5800±750 (Cle-128)			
	Ceramic	7200±750 (Cle-129)			
Hassi Ouenzga	Charcoal		6035±47 (Bln-4956)	7002–6748	5053–4799
	Charcoal		6290±60 (KIA-437)	7414–7013	5465–5064
	Charcoal		6330±60 (KIA-436)	7420–7160	5471–5211
	Charcoal		6611±40 (Bln-4957)	7568–7436	5619–5487
	Charcoal		6683±48 (Bln-4913)	7654–7464	5705–5515
	Charcoal		6770±60 (KIA-434)	7722–7510	5773–5561
Achakar Idoles	Charcoal		5830±80 (Gif A-92332)	6846–6444	4897–4495
	Ceramic	6900±600 (Cle-120)			
El Khil C	Charcoal		5720±151 (Rabat-119)	6894–6213	4945–4264
	Ceramic	6400±500 (Cle-118)			
Wadi Tahadart	Marine shell		5600±200* (UQ 1556)	6858–5938	4909–3989
	Ceramic	6490±560 (Cle-122)			
	Ceramic	5047±580 (Cle-123)			
	Ceramic	6710±510 (Cle-124)			
	Ceramic	6850±520 (Cle-125)			
El Harhoura II	Human bone		5980±210 (Ly-2149)	7317–6351	5368–4402
	Marine shell		5800±150* (Ly-1601)	6966–6296	5017–4347
Contrebandiers	Ceramic	6600±600 (Cle-136)			

Neolithic? In order to gain some insights, we need to consider the archaeological records of adjacent areas of the Maghreb where early Holocene assemblages are well preserved. In Algeria and Tunisia, the Capsian industry can be seen to follow the Iberomaurusian (Lubell 2001). The Capsian, like the Iberomaurusian, comprises lithic assemblages based on the production of bladelets and containing many backed tool forms. One of its distinguishing features, however, is the inclusion of small geometric microliths. Two sub-divisions, the Typical Capsian and the Upper Capsian, are known (Vaufrey (1936). For a long time it was uncertain whether these were contemporary (Camps 1974) or chronologically successive (Grébénart 1976) but reassessment now seems to favour the latter (Jackes & Lubell in press).

No Capsian assemblage of either variant has yet been formally recognized in Morocco. In Algeria and Tunisia, both examples contain geometric microliths but amongst the main distinctions of the Upper Capsian, the later variant, is the greater abundance of geometric microliths and the existence of bladelets produced by pressure flaking (Tixier 1976; Sheppard 1987; Rahmani 2004). Pressure flaked blades are absent so far in the Iberomaurusian of Morocco but they do occur in some Neolithic assemblages, as at Kaf Taht el Ghar. The dating of the Upper and Typical Capsian has recently been reviewed by Jackes & Lubell (in press) and, according to their analysis, the earliest dates for the Typical Capsian fall in the range 9400–9100 BP with a transition to the Upper Capsian at around 8200 BP. These industries overlap in age with the Hattab II burial and its associated assemblage.

Additional diagnostic attributes of the Capsian material culture include ostrich eggshell and marine shell beads plus a variety of bone tools and decorated bone and shell artefacts (Lubell 2001). The Capsian is also characterized by large middens or *escargotières* made up of tens of thousands of land-snail shells which form visible mounds at inland, open-air localities (Lubell 2004a,b). So far, these are largely unknown or unreported from open air sites in Morocco, though well known examples of middens containing ash, charcoal, fire cracked rocks and vast amounts of

https://doi.org/10.1017/S0959774308000255 Published online by Cambridge University Press

terrestrial shells, bone and artefacts are found in Iberomaurusian layers at cave and rockshelters such as Grotte des Pigeons (Roche 1963) and Ifri n'Ammar (Moser 2003). More recently, a shell midden similar to an *escargotière* has been recorded outside the rockshelter of Tissourine, 12 km from the present Atlantic coast south of Essaouira (Chennaoui *et al*. 2005). In this case, the cultural context is still unclear, though an age of 6892±166 BP (Rabat-169) was obtained on *Otala lactea* shell, near the base of the midden.

With respect to the arguments concerning continuity in cultural and funerary activity, dental ablation is still widely regarded as one of the most diagnostic aspects of Iberomaurusian treatment of the living. Ablation of one or more of the upper central incisors, considered as an almost universal modification, as indicated in Late Pleistocene burials (Chamla 1978; Humphrey & Bocaege forthcoming). During this period and leading into the early Holocene at sites like Columnata in Algeria, the practice had diversified to include both upper and lower teeth, with between four and eight incisors removed from all adults in this sample. Further variation can be detected during the later Capsian and Neolithic periods when the practice became further diversified. In the Capsian and Neolithic, individuals had teeth removed from one or both jaws, while others had no ablation at all. Sometimes all three patterns are found in one site (Humphrey & Bocaege in press). Such signs may be the strongest evidence for cultural and population continuity across the Late Pleistocene–Holocene boundary, and we would argue that a parallel case may be made for Morocco, although here the links to the Neolithic still remain tenuous.

On the basis of existing data, we would suggest that an absence of 'transitional industries' in Morocco cannot in itself be used as proof of a major hiatus in settlement prior to the Neolithic. If sites like Hattab II represent a more general pattern, as we suspect, then we would anticipate a later continuity of the Iberomaurusian in Morocco than further to the east. This does not necessarily imply that the relationship of the Iberomaurusian to the Neolithic was analogous with that of the Upper Capsian in Algeria and Tunisia. As already noted, there is a clear divergence in the lithic inventories, most notably in the absence of small geometric microliths and pressure flaking in the Iberomaurusian. Nor are these diagnostic elements present in early Holocene contexts (e.g. Ghar Cahal, Ifri el-Baroud, Hattab II) which might be regarded as late or developed stages of the Iberomaurusian. As we have seen, these changes have only so far been registered in Neolithic Cardial ware assemblages such as Wadi Tahadart and Kaf That el Ghar. We would accept that the nature of transition is complex, as would seem to be borne out by the presence of dental ablation in some Moroccan Neolithic skeletons (Nespoulet pers. comm.) and in neighbouring areas of the Maghreb. This information is preliminary, however, and it needs to be further investigated through systematic dating of burials at key sites covering these cultural phases.

Concluding remarks

The Hattab II skeleton is that of a young adult with a most likely age at death of between 25 and 30 years. The pelvic morphology is strongly indicative of a male but the sexually dimorphic features of the cranium and the over-all size of the skull and postcranial skeleton are more ambiguous. As a male, the skeleton stands out as small compared to the North African Iberomaurusian sample as a whole.

Burial implies a well-developed sense of collective identity both at a local level and perhaps extending over a much wider area of the Maghreb. In northwest Africa, such burials appear to be part of a shared cultural tradition that began in the Late Upper Palaeolithic Iberomaurusian. Despite the information that exists on collective burials, relatively little detail is forthcoming on single inhumations, That raises the question as to whether this was a common funerary practice amongst Iberomaurusian populations; and this is why the example from Hattab II is of special relevance to the present debate.

On the available evidence, we would agree that there are strong indications of population and cultural continuity across the Pleistocene–Holocene divide in Northwest Africa (Lubell *et al.* 1984; Sheppard & Lubell 1991; Irish 2000; Jackes & Lubell in press). In Morocco, this is characterized culturally by a very late persistence of the Iberomaurusian, especially in the north. Hunter-gatherers in this region practiced an economy based on the exploitation of wild species such as barbary sheep and gazelle and left archaeological signatures that remained more or less unchanged until well after the beginning of the Holocene. In the same areas, the archaeological record is characterized by an intrusive Neolithic economy based on cereal cultivation which seems first to have appeared around 7500 calibrated years BP.

Acknowledgements

The authors are grateful to Antonio Faustino Carvalho for his advice on parts of the text. Both Ian Cartwright (photographs) and Alison Wilkins (Fig. 1) are thanked for their help in producing the figures. AB thanks the Ministry of Culture in Morocco and the National Institute of Archaeological Science & Heritage (INSAP) for their support. NB would also like to acknowledge the British Academy for financial support of the fieldwork.

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https://doi.org/10.1017/S0959774308000255 Published online by Cambridge University Press

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